ENVIRONMENTAL ASSESSMENT

AltAir

Short Range Ballistic Target Test Demonstration

Point Mugu, California

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Proposed Action:	Proposal by the USAF/National Air Intelligence Center (NAIC) to conduct a short range flight test demonstration of the AltAir ballistic target.
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The USAF/NAIC proposes to demonstrate the feasibility of air launching a short range ballistic target missile after dropping it from a C-130 aircraft over the Point Mugu Sea Test Range (AltAir demonstration). After launch and subsequent reentry into the atmosphere, the missile will impact into the ocean approximately 170 nautical miles (nm) downrange, about 35 nm offshore from San Nicolas Island.

Alternatives have been examined, issues discussed, and potential impacts identified. Resource areas discussed in this Environmental Assessment (EA) include air, water, ocean resources, marine mammals, sonic booms and impact shock wave, the Channel Islands, cultural resources, socioeconomic resources, and cumulative impacts.

Impacts to marine mammals could occur from direct contact with the missile, shock wave, or explosion should an animal be in the immediate area of splashdown. However, the likelihood of a marine mammal being in the affected area during this one-time shot is extremely low, and the potential for negative impact negligible. Other impacts discussed are very small. Ground activities at Naval Air Weapons Station Point Mugu are minimal in terms any impact produced due to this project.

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List of Acronyms and Abbreviations

AFB	Air Force Base
Al_2O_3	Aluminum Oxide
AltAir	Alternate Air Launched Ballistic Target
BMDO	Ballistic Missile Defense Organization
BO	Burn Out
CA	California
cal	calorie
cc	cubic centimeters
CDFG	California Department of Fish and Game
CEV	USAF Office Code
CFR	Code of Federal Regulations
Cl	Chlorine
CO	Carbon Monoxide
CO_2	Carbon Dioxide
dB	decibel - unit of sound intensity
deriv.	Derivative
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EXSUM	Executive Summary
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
ft	foot/feet
FTS	Flight Termination System
GCS	Guidance Control System
gm	gram(s)
GPS	Global Positioning System
H_2	Hydrogen
H_2O	Water
HCl	Hydrochloric Acid
HM	Hazardous Material(s)
HNS	Hexanitrostilbene
hr	hour
hrs	hours
IBM	International Business Machines
ICC	Interstate Commerce Commission
in	inch(es)
in^3	cubic inches
INS	Inertial Navigation System
JANAF	Joint Army/Navy/Air Force

JP	Designations for types of jet aircraft fuel
kg	kilogram(s) = 1000 gm
km	kilometer(s) = 1000 m
knots	nautical miles per hour
lb	pound = 453.6 gm
lbf	pound-foot(feet)
lbm	pounds mass
lbs	pounds
m	meter
max	maximum
MFSO	Missile Flight Safety Officer
min	minute
mg	milligram(s)
MM II	Minuteman two
N/A	not available
N	north
N_2	nitrogen gas
NAIC	National Air Intelligence Center
NAWCWPNS	Naval Air Warfare Center, Weapons Division
NAWS	Naval Air Weapons Station
NCU	Nozzle Control Unit
nm	Nautical Mile(s), approximately 6080 feet = 1.15 statute miles
O_2	oxygen gas
°C	degrees Celsius
°F	degrees Fahrenheit
°K	degrees Kelvin
PETN	pentaerythritol tetranitrate
psi	pounds per square inch
psia	pounds per square inch, absolute
RCC	Range Commander's Council
RDX	cyclonite ($C_3H_6N_6O_6$) - a high explosive material with many synonyms including hexahydro-1,3,5-trinitro-1,3,5-triazine
RSOP	Range Safety Operational Plan
S & A	Safe and Arm
sec	second(s)
SRM	Solid-propellant Rocket Motor
SVC	Space Vector Corporation
TABR	United States Air Force office symbol
TMD	Theater Missile Defense
U.S.	United States
USAF	United States Air Force
W	west
Wt	weight

EXECUTIVE SUMMARY

The Alternate Air Launched Ballistic Target (AltAir) Short Range Flight Test Demonstration program proposes to demonstrate an air launch target delivery system using standard cargo aircraft. If proven technically feasible, AltAir may provide for a highly flexible short range (≤500 kilometers (km)) target system facilitating multi-shot engagements with high azimuth variability and mobile extended test areas, such as broad ocean areas.

The Demonstration program consists of four individual tests. The first three are demonstration drops (no rocket motor ignition) over land at the Naval Air Warfare Center, Weapons Division (NAWCWPNS), China Lake site to verify parachute extraction and aircraft, missile and parachute dynamics. One of the three is a backup. The fourth test will be a live launch over water on the NAWCWPNS Point Mugu/Sea Test Range and will demonstrate all mission critical elements. The analysis of the potential environmental impact of each test is being conducted on a range-specific basis. **This Environmental Assessment (EA) will be limited to addressing only the live launch at Point Mugu.** This EA presents the environmental analysis in support of a Finding Of No Significant Impact (FONSI) or further environmental document as appropriate. The analysis appears herein even though the project activities on the Range far offshore are exempt from the National Environmental Policy Act, because they are outside the 12 mile limit of United States of America (U.S.) territory. The activities are exempt (upon the issuance of a FONSI) from Executive Order 11214, which addresses environmental requirements and documentation of U.S. international actions. Executive Order 11214 applies when impacts are determined to be significant. A separate programmatic analysis of AltAir's potential application within the Theater Missile Defense test program is also planned.

The demonstration will require the deployment of three aircraft to support the AltAir test and the firing of an SR-19-AJ-1 (modified) rocket motor and payload over the Point Mugu Sea Test Range with its resultant atmospheric re-entry and subsequent entry into the ocean. There is also some risk that launch and/or missile destruction malfunctions could lead to the drop of an intact, or nearly intact rocket motor and payload into the ocean. The drop of the loaded rocket into the ocean, the firing of the rocket motor, and its subsequent entry into the ocean may have potential impact on the environment. This Environmental Assessment (EA) analyzes the potential impacts and indicates their magnitude and importance.

NEED FOR ACTION

The air launch of the AltAir will demonstrate the feasibility of providing target delivery and deployment below the horizon during testing of missile defense elements while providing a ballistic trajectory equivalent to a hostile ground launch, and at the same time reducing infrastructure costs using a standard cargo aircraft.

PROPOSED ACTION

The proposed action will demonstrate the feasibility of launching a short range ballistic missile target from the air rather than from the usual ground launch site. The launch vehicle will be carried to an altitude of about 15,000 feet by a C-130 aircraft and extracted from the aircraft by a parachute deployment system. The launch vehicle will descend to about 5,000 feet where the AltAir will separate from the parachutes, and the SR-19-AJ-1 (modified) rocket motor will be ignited. The target will reach an altitude of about 120 nautical miles (nm) and splash down in the ocean at a distance of about 170 nm after reaching a re-entry velocity of about 3,800 miles per hour (mph).

PROGRAM ALTERNATIVES AND SITE SELECTION

Selection of the AltAir configuration and support equipment for the target system demonstration program was based upon tradeoff studies. A major focus in the equipment selection process was to optimize the use of existing surplus rocket motors and other equipment which would best fit several criteria

including technical feasibility, cost, equipment availability, and environmental compatibility. This approach reduced the need to develop and manufacture new equipment which would have a greater potential for environmental consequences during the production and testing phases. The M56A-1 Solid-propellant Rocket Motor (SRM) was under consideration as an AltAir rocket motor. However, due to recent test failures of the M56A-1, the SR-19-AJ-1 (modified) SRM was selected for the AltAir program.

Program Alternatives

To accomplish the Ballistic Missile Defense Organization (BMDO) objectives it is necessary to test various interceptors against targets presenting realistic threat scenarios. Intercept testing (if and when a full scale target test program is initiated) at the larger over ocean ranges has the added benefits of allowing the use of longer ranged targets and multiple azimuth approaches, and adds assurance that debris from very high altitude (+60 km) intercepts will not pose safety hazards off range. The AltAir program demonstrates the accurate simulation of a target launch under the needed conditions. Test firing of interceptors is a separate and future part of the overall BMDO testing program. Alternatives to the AltAir air launched target testing are:

1. Choosing land launch sites that can launch over the ocean. Since the land launch points are fixed, only a very limited number of realistic threat scenarios can be presented.
2. Launching from several different land launch sites to increase the number of realistic engagement scenarios that can be presented. This alternative would require spending an inordinate amount of time and resources on the development of new launch sites for still relatively narrow and limited applications, and would create new environmental disturbances.
3. Launching target missiles from ocean going vessels. This is technically feasible; however, in contrast to the projected cost of air launch the anticipated cost of building or modifying, operating, and maintaining vessels to sea launch ballistic missile targets is prohibitively expensive. Furthermore: there is a possibility AltAir technology can eventually be adapted in a treaty-compliant manner for long ranged (+500 km) target launches, but funds expended developing short/mid-ranged sea launched target capability would offer no such follow-on utility. Launching targets from sea-going vessels at ranges exceeding 600 km is unequivocally prohibited by U.S. treaty obligations.
4. "No Action." A no-launch/continued-testing-using-ground-launched-targets-only alternative would severely inhibit the progress of theater ballistic missile defense interceptor programs which rely heavily upon the use of realistic targets for testing and development. The Sea Test Range would continue to be used for other previously authorized test programs.

Site Selection

Other ranges considered for the AltAir demonstration test included Yuma Proving Ground, Edwards Air Force Base (AFB), Kauai Pacific Missile Range Facility, Wallops Island, Kwajelein Island, White Sands Missile Range, and Vandenberg AFB. NAWCWPNS Point Mugu ranked first as the test site after environmental considerations, test site requirements, and other factors such as cost, availability, and capability were assessed by the National Air Intelligence Center (NAIC).

Test Site Requirements

The site for the AltAir Air Launch Demonstration must satisfy requirements falling within three broad categories; physical, Range capabilities, and logistics.

Physical Requirements

The launch location must be over the ocean and over the horizon from the intercept test area in a restricted air space about 200 nm long by 140 nm high with airspace control at the launch location at 15,000 feet and below.

Range Requirements

Real-time voice communication is available between the C-130 drop aircraft, Range control center, C-130 launch vehicle communication console, Range telemetry site and support aircraft.

A Range C-130 and two NP-3D aircraft and hangar, target and payload assembly building complete with a 15 ton crane, office space, and ordnance storage facilities are available at Point Mugu to support the AltAir test. Access to machine and electronic shops and services, 20 ton and 2 ton flat bed trucks, and a 7 1/2 ton forklift will also be furnished by NAWCWPNS.

C-Band beacon tracking is available for the C-130 and the launch vehicle payload until its impact with the water. International Range Instrumentation Group timing will be used to tag the collected data. Position data plots of the C-130 and launch vehicle payload are required for a quick look analysis of the test. Redundant telemetry receiving and recording is required.

Photographic services to be provided include various still photos during the pre-drop operations, video or high-speed motion picture films of the interior of the C-130 prior to and during the launch vehicle extraction process; video or high-speed motion picture films of the launch vehicle extraction process exterior to the C-130 via chase aircraft; video or high-speed motion picture film of the launch vehicle's descent from the C-130 as long as possible, and booster ignition and initial motor burn; and the ability to convert all motion picture film to video and produce duplicate copies of the videos.

Availability of standard emergency medical services and facilities is required.

Meteorological data will be required to provide for forecasted and actual weather in the drop zone prior to and during the test.

Logistics Requirements

Range schedule availability to support the entire drop test, as required to meet program schedules and cost allocations, is a necessity. Range air and sea support and other support personnel will be required for the entire test period. Also required are gate passes, visitors badges, eating facilities, space in the C-130, space in the control center, a conference room and personal hygiene facilities the day of the test and also one day prior and two days following the test.

Environmental Considerations

Biological Resources

The portion of the ocean over which the launch will occur will be in the open ocean in the north end of the Range about 75 nm southwest of the nearest land on the California Coast, and about 85 nm west of Vandenberg AFB.

After reentry and impact, The launch vehicle will drop into water more than 1000 feet deep and not be recovered. At such depths any missile components will not pose a hazard to fishermen or divers. The SR-19-AJ-1 (modified) rocket motor will contain about 13,562 pounds of solid rocket propellant. If a failed launch deposits the unburned motor with propellant into the ocean, it is expected that because of the plastic binder used, the propellant will dissolve at a slow rate. Because of the discrete nature of a failed launch event, the large amount of water for solution and the depth at the launch area, no substantial harm, if any effect occurs at all, will occur to marine life from the propellant or rocket motor parts.

The missile impact into the ocean will be at supersonic velocity – about three times the speed of sound. At this velocity the missile, which weighs about three tons, could potentially produce a shock wave

underwater and affect marine mammals if they were in the area. However, it is unlikely a mammal would be in the area or be close enough to be affected.

The propellant may explode upon impact into the ocean after a failed launch. Potentially, the resultant shock wave should an explosion occur, could harm marine mammals. However, it is unlikely that a mammal would be present, and quite unlikely the launch will both fail and produce an explosion. The splashdown of the fired launch vehicle will occur in the open ocean about 90 nm from the mainland off the California coast, about 35 nm southwest of San Nicolas Island which is the nearest land, and about 65 nm south of Santa Rosa Island. Marine mammal densities this far from land are low.

Three parachutes with shroud lines will be deposited in the water near the launch site. One parachute will be carried to the ocean floor with the steel sled, and two parachutes will be carried to the ocean floor by the weight of their bridle and attachment hardware. Because the launch site is 35 nm from pinniped haul out sites, the likelihood of a cetacean encountering the descending parachutes remote, and the eventual depth of the parachutes greater than 10,000 feet, it is highly unlikely a negative impact to marine mammals will occur due to use of parachutes in this test.

The propellant will be exhausted from the spent rocket. Relatively small quantities of hazardous materials, similar to those on other test vehicle ocean entries, will be on the test rocket. They are not expected to dissolve rapidly and will not cause any considerable impact. The splashdown site is about 90 nm from the National Marine Sanctuary at Santa Barbara and Santa Rosa Islands, 35 miles from the marine mammal breeding areas at San Niclosas Island, and offshore from whale migration routes. Federally listed threatened or endangered species in the area include: four birds (three on land) and seven whale species that are endangered; and one seal, one sea lion, and sea otter species that are threatened. The chances of directly striking marine mammals or any animal by the missile, sled, or parachutes is extremely small.

Air Resources

The proposed ocean test area is offshore beyond the area of jurisdiction of the Federal Environmental Protection Agency. The prime air emission source in the test will be engine exhausts of the aircraft involved - the C-130, the two NP-3D support aircraft, and the exhaust of the single AltAir rocket motor. Air emissions from the rocket motor firing are summarized in the EA. Air emissions from the aircraft used in this one time test operation are relatively minor and are part of the normal operations of the Range. Also, the majority of the aircraft operating time will be far offshore. The air emissions from the AltAir test operations will have minimal impact

Cultural Resources

Since the test will not occur over or near any archeological, historic, or socioeconomically important resources, there will be no adverse environmental impact.

Land Resources

This ballistic target test will not occur over land resources; there will be a minimal increase in the level of flight activity at Naval Air Weapons Station (NAWS) Point Mugu due to aircraft used for the test.

Human Resources

All ocean going vessels and aircraft will be routinely notified to clear and avoid transiting the test area during the test, and during reasonable times before and after the test. Two NP-3D aircraft will visually ascertain the test area of the Range is clear prior to deployment of the AltAir ballistic target. All standard Range safety precautions will be followed for the test. Safety clear zones based on malfunction senarios are well beyond any land. Since the test will not be over or near an inhabited area, there will be no increase in danger to human populations as a result of this demonstration test.

CONCLUSIONS

This EA has determined that at most only very small adverse impacts are expected to be imposed upon air, water, land, archaeological, cultural or, historic resources as a result of the proposed action. Marine mammals may be affected by an explosion of propellant in a failed rocket or from a shock wave produced due to the missile stricking the ocean at supersonic velocity.

1.0 PURPOSE AND NEED FOR PROPOSED ACTION

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1.1 Purpose

Working as Executing Agent for the Ballistic Missile Defense Organization (BMDO), United States Air Force Naval Air Intelligence Center (USAF/NAIC) proposes to use Point Mugu tracking facilities and the Sea Test Range for the first live-fire test validating the proposed technologies and procedures for using standard cargo aircraft to launch realistic, short ranged (≤500 kilometers (km)), ballistic missile targets (a.k.a. "AltAir"). A C-130 would be flown over the Sea Test Range. Parachutes would be used to extract a pallet with an SR-19-AJ-1 (modified) Minuteman booster from its hold, and also used to stabilize the booster in its descent. See Figure 1-1. Once stabilized, the missile would be ignited after being released from its parachutes and tracked to a pre-planned impact point within the Sea Test Range

The purpose of the AltAir short range flight test demonstration program is to develop an air launch target delivery system using standard cargo aircraft. If proven technically feasible, AltAir will provide a highly flexible short range (≤500 km) target system allowing multi-shot engagements with high azimuth variability, and facilitate the temporary designation and use of extended test areas, such as broad ocean areas. The program will also provide target delivery and deployment below the horizon during the testing of missile defense elements while providing a ballistic trajectory equivalent to a hostile ground launch.

1.2 Background

Ballistic missile defense programs have been limited by the availability of launch ranges that satisfy flight test scenarios dictated by program operational requirements. These requirements typically call for various combinations of target reentry angles, velocities and altitudes which means that testers must identify a series of launch ranges that best represents operational realism. Unfortunately, test programs are often faced with the choice of 1) choosing an existing site that forces unrealistic engagement scenarios; 2) designing test scenarios that require stressing maneuvers for target upper stages - needlessly complicating a preferably simple vehicle; or 3) spending inordinate time and resources on the development of new launch sites for relatively narrow and limited applications.

Several Environmental Assessments (EA) and Environmental Impact Statements (EIS) have been completed for tests of missile firings that have hardware or test scenarios similar to the AltAir. The three stage Pegasus rocket, equipped with a solid propellant booster, is carried aloft and launched from an altitude of about 40,000 feet (ft). About four military and 12 commercial launches have been successfully completed off the coast of southern California. An EA was prepared and a Finding Of No Significant Impact (FONSI) was issued in 1989 (Reference 1). The Taurus four stage rocket equipped with a relatively large solid propellant booster was planned to be land launched from Vandenberg Air Force Base (AFB). The Taurus expended booster would separate from the rocket and drop into the ocean off the coast of southern California. An EA was completed in 1992 and a Finding of No Significant Impact (FONSI) was recommended (Reference 2). The Hera single stage rocket, equipped with essentially the same rocket motor as the AltAir, was planned to be land launched from the White Sands Missile Range in New Mexico. Although the Hera launch and subsequent flight would be over land, characteristics of the Hera rocket flight are similar to the AltAir. An EA was completed and a FONSI was issued in 1994 (Reference 3). An EIS was prepared for the Theater Missile Defense (TMD) Extended Test Range program to examine potential environmental impacts of launching variations of the Hera rocket from four different locations. One of the locations examined was the Western Sea Test Range off the coast of southern California and included San Nicolas Island. The TMD EIS concluded there would be no significant environmental impacts on the Western Sea Test Range as a result of the launching and splashdown of Hera rockets (Reference 4).

The development program plans are for four tests using the Minuteman booster. Three development tests are non-firing drops at NAWCWPNS China Lake and are used to verify parachute

extraction and aircraft, missile and parachute dynamics, prior to the booster motor-powered ("live") launch. Two previous tests using a concrete canister instead of the rocket motor already have been accomplished. Only the live fire test (the fourth test) will be a live launch at the NAWCWPNS Point Mugu/Sea Test Range and will demonstrate all mission critical elements. Only that live fire test is addressed in this environmental assessment. The drop vehicle used for the tests employs extraction and deployment of all three parachutes. Test drop 3 has full deployment of all the components of the live fire, except that the motor is not fired and some reusable hardware will descend on the main chutes for recovery. The motor free falls to earth. Environmental considerations for the tests at China Lake are addressed in a "Determination of Continuing Activity" which was issued by NAWCWPNS China Lake (Reference 5). NAWCWPNS China Lake determined that the proposed three tests there are considered a continuing activity, consistent with existing range activities and land and land uses, and therefore not subject to the preparation of a NEPA document.

The fourth test will use an SR-19-AJ-1 (modified) rocket motor with a payload attached through a Minuteman 2-3 interstage. The payload will consist of a guidance/control system (GCS) module with an attached nose cone. The launch vehicle will be carried to an altitude of about 15,000 feet by a C-130 standard cargo aircraft and extracted from the aircraft by a parachute deployment system. The launch vehicle will descend to about 5,000 feet on the parachute system, at which time the parachutes will be released and the rocket motor ignited. See Figure 1-1.

The trajectory will have a ground range of about 170 nm and an apogee (maximum altitude) of about 120 nm (775,000 feet). Reentry velocity into the atmosphere will be about 3,800 mph with a reentry flight path angle of -63.5 degrees from horizontal. The live launch will have an internal navigation system (INS)/global positioning system (GPS) onboard. The GPS will be used to update the INS prior to (but not following) the launch vehicle extraction from the aircraft. In the event GPS data could not be collected, the INS information would still be valid for success of the launch.

This development program will require a target drop over the horizon from the test range ground based tracking sites. The drop over the horizon will require an airborne mobile Flight Termination and telemetry signal relay capability. The live launch will be toward the Range tracking sites to allow those assets to focus on the terminal phase, which will be of most interest in defensive element testing. See Figure 1-2.

1.3 Need For Action

The proposed AltAir test three is required to verify:

a) the safe and successful deployment of ballistic targets from standard Navy cargo aircraft (C-130).

b) the aircraft can be dispatched to a designated launch location and launch the target on time along a required trajectory;

c) the deployment scenarios, timeliness and target safety systems provide positive command and control;

d) the guidance technology meets trajectory accuracy requirements including platform initialization and deployment environments (angular rates, etc.);

e) the aircraft, missile and Range operations probable costs;

f) the feasibility of using an integrated GPS/INS subsystem to provide high fidelity state data to initialize the air deployed launch vehicle;

g) the interface between the GPS/INS subsystem and communication system to assure safe deployment, controlled Instantaneous Impact Prediction and precise targeting; and

h) the feasibility of utilizing GPS/INS state data to independently support Range safety decisions.

If an AltAir air-launch system is proven to be feasible, it may result in reduced infrastructure costs and may have far fewer adverse impacts upon the environment than current ground launched target options (Reference 6).

1.4 Decision To Be Made

The decision to be made is whether to approve the AltAir test at the Point Mugu Sea Test Range as proposed in this EA. The Commander of NAWCWPNS Point Mugu is authorized to make a decision for the test based on this EA and receipt of a Finding of No Significant Impact (FONSI), as appropriate, from the Office of the Chief of Naval Operations and the Naval Air Systems Command.

1.5 Basis for Environmental Assessment

The launch and ocean entry occur outside of the territorial waters of the United States. The governing environmental requirement is Executive Order 12114 "Environmental Effects Abroad of Major Federal Actions" which applies to major Federal actions significantly affecting the environment of the global commons outside the jurisdiction of any nation (the ocean) (reference 26). Upon the conclusion by FONSI based on this EA, that the effects from the project are not significant, E.O. 11214 does not require an environmental document for the range activities which are far offshore.

However, the launch involves existing United States of America (U.S.) ground based facilities to support the personnel and aircraft for the test, some potential for impact to marine biota from the missile splashdown and sonic booms, and potential for public controversy. It is sound business practice and Navy policy to study the impacts and present their analysis in an environmental document, insuring potential effects are not overlooked. Thus, details of the environmental effects and their analysis are presented in this EA, in NEPA document format to support the FONSI.

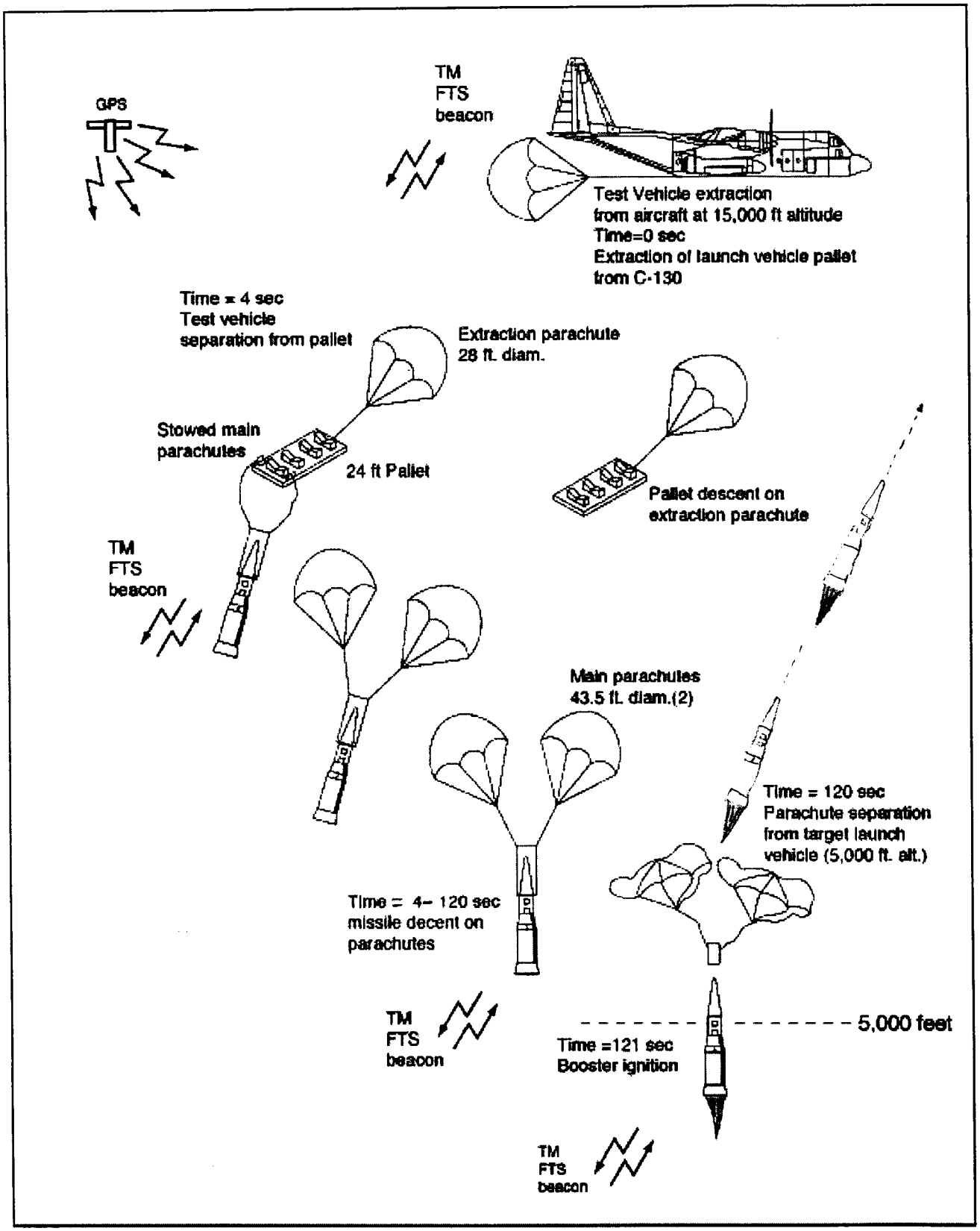
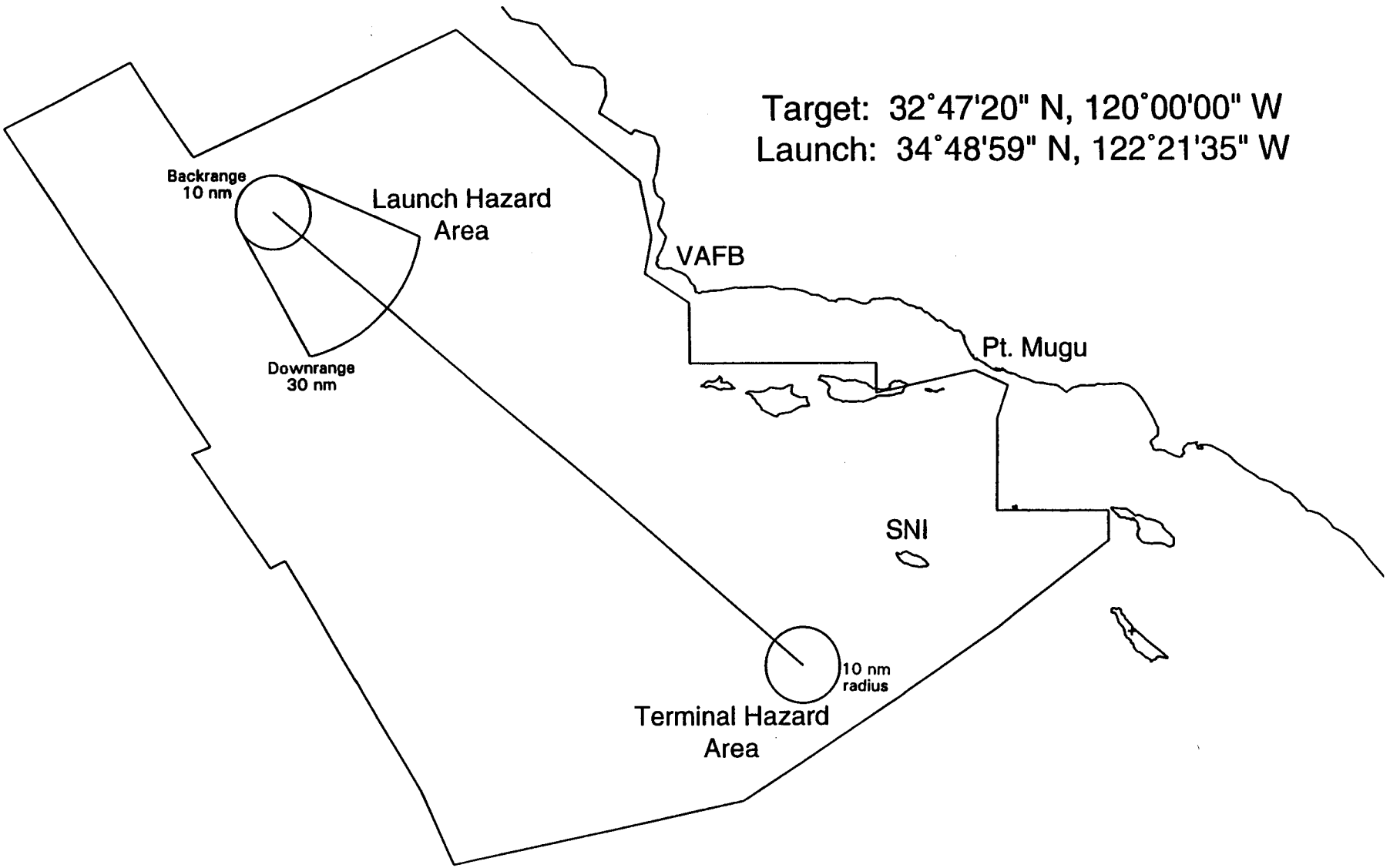


Figure 1-1. AltAir Launch Deployment Scenario. (Times Approximate)

PROPOSED F-DROP SCENARIO

Figure 1-2.



2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

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2.1 Program Objective

The specific objective of the AltAir Demonstration Program is to demonstrate the feasibility of successfully launching a ballistic missile from the air after it has been dropped from a C-130 standard cargo aircraft. This demonstration will provide for a highly flexible short range 320 km (170 nm) target system allowing multi-shot engagements, higher azimuth variability and mobile extended test areas for over ocean testing. The alternatives to be considered are: perform the proposed action or do not perform the action on the NAWCWPNS Point Mugu/Sea Test Range.

2.2 No-Action Alternative

The No-action alternative for the AltAir program would be to not test the AltAir at all. This action could inhibit the progress of the TMD interceptor programs which rely significantly on the use of realistic targets for testing and development. Because TMD supports the overall BMDO program, national defense policy goals would not be accomplished under the No-action alternative.

2.3 Site for the Test

NAWCWPNS Point Mugu was highest in the ranking process used to designate the proposed site of the AltAir demonstration test. The various Department of Defense (DoD) ranges were considered, and weighted factors were used in the selection evaluation (reference 27). The factors included range cost, availability, support facilities, and instrumentation; environmental impact documentation process; and C-130 aircraft availability, cost, payload/safety certification, and capability. Ranges considered included Yuma Proving Ground, Edwards AFB, Kauai Pacific Missile Range Facility, Eglin AFB, Wallops Island, Kwajelein Island, White Sands Missile Range, and Vandenberg AFB.

The Point Mugu Sea Test Range complex currently has the necessary capabilities to support the AltAir demonstration test. The Range annually supports several hundred live missile launches from the air, the ground, ships and from underwater. Spent missiles, dud missiles, targets and debris from missile/target impacts routinely fall into Range controlled waters. Except that the AltAir is a much bigger missile with a larger propulsion system, the proposed action scenario is very similar to many other missile actions on the Range. Moreover, Vandenberg AFB routinely fires Intercontinental Ballistic Missiles over the Western Range Complex and drops spent booster rocket motors through Range controlled airspace and into Range controlled waters.

Naval Air Weapons Station (NAWS) Point Mugu is fully capable of handling all aircraft operations required by the proposed action. Secure ordnance assembly facilities, along with trained ordnance handlers and mechanics, capable of accommodating the AltAir are also available at NAWS Point Mugu. State-of-the-art Range safety, tracking, and communications equipment and procedures are in place on the Range. The Point Mugu Sea Test Range is one of largest, most completely instrumented weapons testing ranges in the world - about 170 nm maximum width and 260 nm maximum length encompassing about 32,000 square nautical miles of air space and ocean area.

Channel Islands National Park, comprised of five of the Channel Islands, the National Marine Sanctuary around those islands to 6 nm from the shore, and the remaining 3 islands under private and Navy ownership, have several endangered and threatened species. Marine mammals are present in the ocean waters.

2.4 Proposed Action

The proposed action is to conduct a demonstration of the AltAir launch from the air on the Point Mugu Sea Test Range (Figure 2-1). A schedule of events for the demonstration operation is in Appendix A, and a description of the demonstration is provided below.

2.4.1 Launch Test

The AltAir Short Range Flight Test Demonstration program purpose is to develop an air launch target delivery system using standard Navy cargo aircraft.

A launch over the horizon from land based sensors, as planned, will require airborne Flight Termination and telemetry relay capability. This will provide target delivery and deployment below the horizon during the testing of missile defense elements while providing a ballistic trajectory equivalent to a hostile ground launch. A critical element of the AltAir flight test is the collection of data during the terminal stages of the missile's flight. This data will be used to assess the relative realism of an air launched target. To facilitate collection of this terminal phase data, the target will be launched toward the Range's land based sensors from the seaward side of the Sea Test Range. Ship-based tracking systems may also be utilized during the test.

This development program will use an SR-19-AJ-1 (modified) rocket motor with a payload attached through a Minuteman 2-3 interstage. The payload will consist of a GCS module with an attached nose cone. The launch vehicle will be carried to an altitude of about 15,000 feet by a C-130 standard cargo aircraft and extracted from the aircraft by a parachute deployment system.

The horizontal AltAir secured to a ridged steel undercarriage (sled) will be extracted from the C-130 by a 28 foot diameter parachute deployed out the open rear door of the aircraft. Soon after exiting the aircraft, explosive bolts release the restraints securing the target to the sled. While the target free falls from the sled, it extracts two 43.5 foot diameter parachutes from two parachute packs secured to the sled. The 3,875 pound steel sled will descend with its parachute into the ocean where it will soon sink to the ocean floor taking the parachute with it. See Figure 1-1.

The launch vehicle will descend to about 5,000 feet on the parachute system, at which time the parachutes will be released and the rocket motor ignited. The two parachutes' bridle shackles are attached to the guidance section mid-ring utilizing five parachute attachment blocks and explosive bolts. Upon initiation of the activation sequence, the explosive bolts release the five bridle shackles and the target falls away from the parachutes. The rocket motor of the free-falling launch vehicle is then ignited and begins its flight. The parachutes descend to the ocean where they will be pulled to the ocean floor by the 400 pound (lb) weight of the parachutes themselves, and the 116 lb weight of the bridle, bridle shackles and other parachute system fittings. See Figure 1-1.

The trajectory of the live launch will have a range of about 320 km (170 nm) and an apogee (maximum altitude) of about 220 km (120 nm) with a total flight time of about 8 minutes (min) 20 seconds (sec). Reentry velocity will be about 1.7 km/sec (3,800 mph) with a reentry flight path angle of -63.5 degrees (angle with the earth's surface). The target vehicle will have an INS/GPS onboard. The GPS will be used to update the INS prior to (but not following) the launch vehicle extraction from the aircraft. In the event GPS data could not be collected, the INS information would still be valid for the success of the launch.

The launch test will occur on the Point Mugu Sea Test Range (Figures 1-2 and 2-1) at about 122.3° W longitude and 34.8° N latitude. This is about 85 nm west of Vandenberg AFB and 75 nm southwest of the nearest land (Point Piedras Blancas). The ground projection of the target flight path will be a line about 170 nm in length to splashdown at a point about 35 nm southwest of San Nicolas Island at approximately 120.0° W longitude and 32.8° N latitude. The scenario for for the AltAir vehicle splashdown is shown in Figure 1-2. The ground path of the missile trajectory is far offshore from any of the Channel Islands. The actual locations or the launch and splashdown depend on flight safety considerations which are updated until the time of the launch. Safety requirements dictate that no personnel shall be exposed to hazard or debris from a normal or failed launch. The splashdown location will be far enough from land to prevent a safety hazard, yet close enough to allow ground-based telemetry systems to track the vehicle and record flight information. Demonstration of acquisition of the flight data is one of the primary mission considerations of the AltAir program.

2.4.2 Rocket Motor

The rocket motor used for the live launch will be an SR-19-AJ-1 (modified) SRM with about 13,562 pounds of ANB-3066 propellant. The propellant will be comprised generally of 73% ammonium perchlorate (NH_4ClO_4), 12% carboxy terminated/polybutadiene, and 15% aluminum. The rocket motor propellant major products of combustion will be carbon dioxide (CO_2) - 4.61%, carbon monoxide (CO) - 21.3%, water (H_20) - 12.46%, hydrogen (H_2) - 1.82%, hydrochloric acid (HCl) - 22.48%, nitrogen (N_2) - 8.75%, chlorine (Cl) - 0.14%, and aluminum oxide (Al_2O_3)(s) - 28.32%. Detailed propellant data is provided at Appendix C. The entire live launch vehicle is 27.83 feet long with a diameter varying between 60.5 inches and four inches, and weighs 19,945 pounds prior to launch. Appendix B shows the rocket configuration. The rocket motor is fitted with a flight termination system (FTS) to terminate the flight if unsafe conditions develop during the powered portion of the flight. The proposed FTS technique is to detonate an explosive charge which ruptures the rocket motor casing and terminates the thrust of the rocket motor. The FTS initiation charge consists of 108 inches of 2.5 grains/foot Flexible Confined Detonating Cord and the FTS explosive ordnance consists of 198.5 inches of 100 grains/foot RDX linear shaped charge.

Other devices on the launch vehicle containing potentially explosive or hazardous materials include explosive bolts, initiators, detonators, ignitors, squibs, gas generators, and batteries, most of which should be expended or destroyed between missile ignition, flight, reentry and splashdown (Reference 6). See Appendix B for a list of all propellant, explosive, pyrotechnic, and hazardous devices aboard the AltAir.

2.4.3 Transportation

The proposed test area is located over open water near the northwestern edge of the Point Mugu Sea Test Range warning area boundaries. However, test support personnel will travel among various locations at Point Mugu (telemetry facility, base operations, etc.). Physical access to these facilities is controlled at the base entry gates, which are monitored by guards whenever they are open. Government, contractor and visitor personnel would also generate local traffic between their places of lodging and these facilities during the test.

Personnel from NAWCWPNS China Lake required for the test will use the daily scheduled shuttle aircraft to travel to and from Point Mugu. The C-130 aircraft based at NAWS Point Mugu, will be loaded with the AltAir, mating sled, and support equipment and take off from NAWS and fly to the proposed test site. The total operating time of the C-130 is estimated at two hours during the test, with one hour within and one hour outside of the Ventura County Air Quality Nonattainment Area. An additional pre-launch flight may also occur. Two NP-3D aircraft from Point Mugu will be used to clear the Range operation area. A scenario for clearing is to fly back and forth in parallel sweeps within the visual range of spotting craft on the water. After clearing the area, one NP-3D would loiter near the midpoint of the target trajectory to relay telemetry signals and one would loiter near the launch site to videotape and film the target deployment and launch operations outside of the C-130. The total operating time of each NP-3D is estimated to be less than 10 hours during the test, with one hour within and the remainder of the hours outside of the Ventura County Air Quality Nonattainment Area. At the conclusion of the test all three aircraft will return to NAWS Point Mugu.

2.4.4 Safety

In order to reduce the large amount of hazardous area characteristic of a ballistic rocket, a Flight Termination System (FTS) will be used to destroy the AltAir vehicle if it deviates significantly from its intended flight path. The AltAir FTS is a dual redundant system that conforms to Range Commanders Council (RCC) 319-92 (FTS Commonality Standard) and has received approval from the NAWCWPNS Range Safety Office. The FTS will be remotely controlled by an experienced Missile Flight Safety Officer (MFSO) from ground transmitters at Pt. Mugu and San Nicolas Island (SNI) or from airborne transmitters on a NP-3D range aircraft.

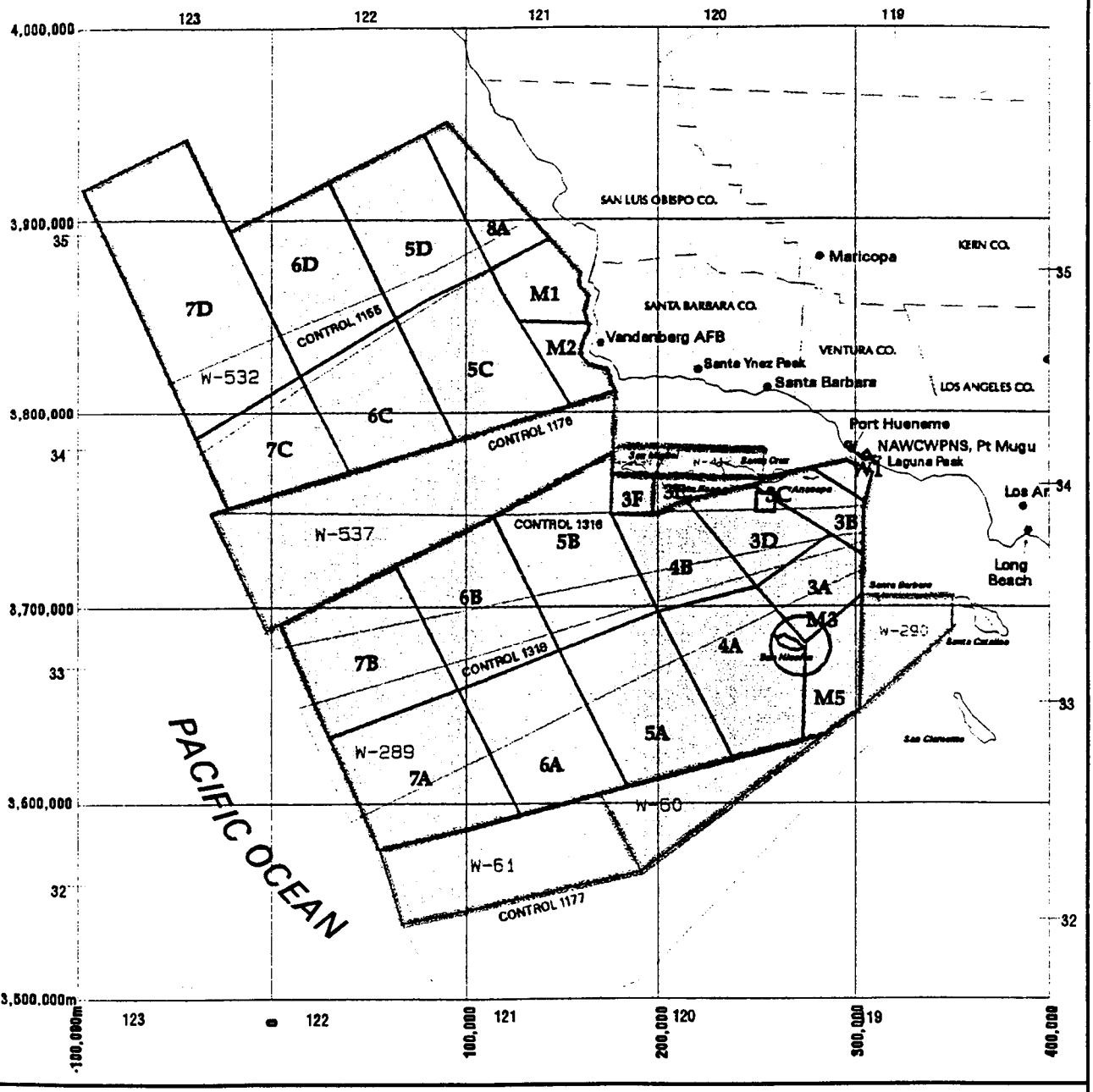
The FTS is an independent system and has a linear shaped charge, detonators, and safing and arming device. The final arming occurs after vehicle separation from the sled. If the mission is to be terminated, Range Safety will transmit tones which are received and decoded in the FTS receivers initiating an electrical current which results in the linear shaped charge exploding and splitting the motor case.

Prior to the AltAir mission, the NAWCWPNS Range Safety Office will issue a Range Safety Operational Plan (RSOP) which describes the criteria used by the MFSO to make a flight termination decision. It is based on the Flight Safety Report prepared by the launch contractor. The RSOP will also describe those areas of ocean that will be required to be clear of all non-participating air and surface craft. The RSOP is prepared in compliance with NAWCWPNS policies and in accordance with NAWCWPNS Instruction 5100.2. A preliminary sketch showing the Sea Test Range and the associated hazard and protection areas appears as Figure 1.2.

The September 1996 Flight Safety Report (reference 24) contains the flight safety data required by NAWC for approval of the launch of the AltAir vehicle. For a normal launch, variables which include wind, targeting corrections, gyro drift, drag, and other variable factors result in the calculation of a probable impact area. Computer simulations were accomplished by the launch contractor using known ranges of the variables involved.

The launch hazard area is designed to contain all AltAir debris in the event that a command destruct event occurs before 40 seconds of flight. After 40 seconds and before rocket burnout at 67 seconds, the probability of missile failure is significantly reduced and an Instantaneous Impact Prediction (IIP) computer model is used to calculate a dynamic hazard pattern that will traverse from the launch area to a terminal splash area that will be cleared of all contacts. If and when the IIP indicates that debris will endanger protected areas of the Sea Test Range, the MFSO will issue a command destruct message to the AltAir vehicle.

NAWCWPNS POINT MUGU SEA RANGE



California Mainland and Channel Islands
Pacific Ocean
Sea Range
Warning Area Boundaries
Control Area Extensions

Projection: Universal Transverse Mercator, Zone 11
North American Datum of 1927
100,000-Square Meter UTM grid lines shown = 54 nm
1-Degree Lat-Long grid ticks shown

Figure 2-1

3.0 AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

Point Mugu has been involved in weapons development and testing since World War II. The site was chosen for its marine environment, accessibility, and safe flying conditions. This section provides a general description of the physical and socioeconomic environment of Point Mugu and the surrounding land and ocean areas (Figure 3-1). The proposed test area lies totally within the Sea Test Range which is over open ocean, and is west of the eight Channel Islands including San Nicolas. San Nicolas Island is wholly Navy-owned and has a runway and tracking instrumentation.

3.1 NAWCWPNS/NAWS Point Mugu Mainsite and Sea Test Range Areas

3.1.1 Background

The Point Mugu Naval Complex, its original name, was first developed during the 1943-1945 period of World War II. In 1949 the Naval Air Station was commissioned. By 1958 the Pacific Missile Range (as it was then known) had grown to employ 4,800 personnel (Reference 7). Various name changes ensued, with the current nomenclature being Naval Air Weapons Station Point Mugu.

Point Mugu has been directly involved in the test and evaluation of most of the past, and is involved with the current, air-to-air, surface-to-air, air-to-surface, subsurface-to-surface, and air-to-subsurface naval weapons systems. NAWCWPNS, Point Mugu also plays a big role in supporting fleet missile firing training exercises by launching targets from the air, land, and ocean surface, and supports conventional weapons, mine, and bombing exercises on the Sea Test Range. Targets from 13 different target families are designed, developed, tested, evaluated, deployed, and operated at Point Mugu. Launch facilities are also available on San Nicolas Island, located about 65 nm south of Point Mugu. San Nicolas Island is wholly owned by the U.S. Navy and has an airfield and extensive tracking instrumentation.

3.1.2 Location

3.1.2.1 Mainsite

The station encompasses approximately 4,486 acres in Ventura County, CA, of the Oxnard Plain and the western extremity of the Santa Monica Mountains. Situated about 50 miles northwest of Los Angeles on the Pacific Ocean coast, NAWS Point Mugu is bounded on the south by the Pacific Ocean and to the north and west by open agricultural land. The nearest communities are Oxnard 6 miles to the Northwest, Port Hueneme 4 miles to the west and Camarillo, seven miles to the northeast. The Santa Monica Mountains National Recreation Area is also located adjacent to the main base.

3.1.2.2 Sea Test Range

The Sea Range is located in the Pacific Ocean off the coast from Point Mugu. The range is usually depicted as the borders of 32,000 square nm of controlled airspace. However, the total expanse of the range is governed by the capabilities of the range instrumentation to support testing while maintaining adequate safety. This results in over 125,000 square miles of instrumented area. The range is divided into the Inner Sea Range and the Outer Sea Range (See Figure 2-1).

The Inner Sea Range is that area bounded by the eastern and southern warning area boundaries and an imaginary line that connects Point Mugu to San Miguel Island in the north and San Miguel, San Nicolas and San Clemente Islands in the west. This area of the range has the most extensive instrumentation coverage. Also the waters are generally calmer than those in the Outer Sea Range.

The Outer Sea Range extends from the San Miguel - San Nicolas imaginary line seaward as far as instrumentation will allow. With the use of the Extended Area Tracking System, Airborne Telemetry System and relay aircraft, this is nominally an arc centered on SNI with a radius of 250 miles.

The Outer Sea Range is composed of deep pelagic waters, with depths to 12,000 feet and more. This area also supports many species of marine mammals, both resident and migratory, whose distribution and abundance changes seasonally and in response to changing oceanographic conditions. It is also part of an international bird migratory pathway known as the Pacific Flyway, which supports the migration of hundreds of thousands of birds each year.

Air and surface-launched missile tests, aircraft flight tests, as well as fleet exercises involving aircraft, ships, submarines, and targets are routinely conducted in the Sea Test Range area. Airspace utilization is under the jurisdiction of, and coordinated by the Federal Aviation Administration (FAA) and other federal agencies.

3.1.2.3. Airspace

NAWCWPNS Point Mugu has responsibility for more than 32,000 square nm of Special Use Airspace (SUA) over the Pacific Ocean. The SUA controlled and scheduled by Point Mugu includes restricted areas and warning areas. Military Training routes also exist between Point Mugu and China Lake.

Restricted areas are airspaces formally established under Federal Aviation Administration (FAA) regulations. Restricted airspace is used to exclude all non-authorized aircraft and to contain hazardous military activities including Range testing activities. NAWCWPNS at Point Mugu is the using agency for three restricted areas, which are over Point Mugu and San Nicolas Island.

Warning areas are designated airspace for military activities that are in international airspace. They are located over the coastal waters of the United States outside of territorial limits. Flight by non-participating aircraft is not prohibited in these areas since they are over international waters. When the warning areas are in use, the controlling agency notifies civil, general and other military aviation through a Notice to Airmen (NOTAM). The NOTAM provides appropriate information to the FAA and its air traffic control agencies to route traffic around these warning areas when they are active. This does not preclude uncontrolled air traffic from entering the warning areas even when the areas are active. DoD Directive 4540.1, Use of Airspace by U.S. Military Aircraft and Firings over the High Seas, provides guidance for operating within warning areas.

NAWCWPNS Point Mugu is the using agency for eight warning areas. All or part of these warning areas are in international airspace over the Pacific Ocean. The AltAir launch and splashdown occur in these warning areas. These warning areas are active on an intermittent basis and are activated in coordination with the FAA and published by NOTAM. The locations of the warning areas have an impact on civil and general aviation, especially air traffic from the Los Angeles area to Hawaii. The overseas air route structure passes through the warning areas via Control Area Extensions (CAEs). Five CAEs cross these warning areas. Memoranda of Agreement exist between Point Mugu and FAA which address the usage of the warning areas, conditions under which the CAEs can be shut down and other general agreements that allow for military and civil aviation to operate with minimal disruption to their respective activities.

3.1.2.4. Existing Jurisdictions and Management

The National Park Service (NPS) is responsible for managing Channel Islands National Park, which includes the northern Channel Islands (San Miguel-9,325 acres, Santa Rosa-52,974 acres, Santa Cruz-60,645 acre (a portion is private), Anacapa-699 acres) and Santa Barbara Island (640 acres). 90% of Santa Cruz Island is owned and operated by the Nature Conservancy but some activities are conducted jointly with NPS. The Park includes waters within one nm around the islands and undertakes enforcement

subject to an agreement with the California Department of Fish and Game, which is responsible for the management of living marine resources in California. The Channel Islands National Marine Sanctuary, which extends the National Park boundary to include waters out to 6 nm from shore, is under the jurisdiction of the National Oceanic and Atmospheric Administration. (NOAA). The National Marine Fisheries Service enforces the the Marine Mammal Protection Act within the Sanctuary and the Sea Range. Also, the Coast Guard holds a broad responsibility for enforcing all federal laws in navigable waters. San Clemente and San Nicolas Islands are owned by the Navy, and Santa Catalina Island is privately owned.

3.1.3 Facilities

3.1.3.1 Mainsite

NAWCWPNS Point Mugu maintains an extensive set of laboratories and test facilities on the coastline. In addition there are public works facilities, temporary and permanent housing for military personnel and their families, and other facilities typical of a fully functioning military base. Approximately 2,700 military personnel are currently assigned to Point Mugu. Total military and civilian employment, including contractors, is approximately 9,000. Expenditures resulting from Point Mugu's operation are more than $360 million annually.

NAWS Point Mugu maintains three runways. The primary runway is 11,000 by 200 feet. All are lighted, equipped with arresting gear, and have ground controlled approach capabilities. Secure weapons storage facilities, assorted aircraft support shops, and computer facilities are also available (Reference 8). The AltAir test operations will require the use of an existing hangar for loading the C-130 with the launch vehicle and support equipment. The operation will also require the use of existing buildings for rocket motor and payload build-up, and for assembling the rocket motor to the payload. Existing spaces with room for six desks, personal computers, a telefacsimile machine, a copy machine, and at least six people will be utilized. The Range will provide all utilities, including phone lines with long distance service, building maintenance, and janitorial services required throughout the duration of the operation. Existing machine, electronics, and other shops will be utilized for testing and minor modifications of the equipment used in the AltAir operations (Reference 6).

3.1.3.2 Sea Test Range

The Sea Test Range is monitored by instrumentation located on the coast of California and on the islands of San Nicolas and Santa Cruz. San Nicolas Island, entirely Navy-owned, has a considerable number of support facilities including an airfield, housing with a galley, public works facilities, and target launch facilities. Santa Cruz Island is the home of a Range instrumentation site leased from the Nature Conservancy. The 11-acre facility includes housing and messing facilities, radio transmitters, surveillance radar, a power plant and a well (Reference 10).

3.1.4 Climate

3.1.4.1 Mainsite

The climate of the center is typical of the southern California coastal zone and is characterized by mild temperatures, low annual rainfall, partially overcast summers, and mostly sunny winters. Surface winds at the station are usually from the west at a mean speed of 9 miles per hour. The mean annual temperature is near 58.5 °F and the relative humidity averages 75%. Point Mugu averages about 10.5 inches of rainfall per year. Because of variations in the local weather, it is often possible to operate in a foggy, cloudy atmosphere and a dry clear atmosphere on the same day through choice of elevation, location and time of day (Reference 8).

3.1.4.2 Sea Test Range

Weather conditions across the Range and islands tend to be localized and seasonally variable. This is typical of a coastal Mediterranean climate with a predictable yearly weather pattern. January to March are the months receiving the most rain. San Nicolas Island averages about 6.5 inches. Associated with the frequent weather fronts are strong winds, poor water visibility, and four to six foot swells. On San Nicolas island the wind is primarily from the northwest at a mean speed of 14 nautical miles per hour. Winter water temperatures around the Channel Islands do not exceed 55°F to 60°F.

Coastal fog and low clouds prevail during April and May, and the sea surface grows calmer as frontal activity diminishes. The most favorable and predictable weather conditions are from June to September when weather fronts are infrequent and seas are generally calm. Fog is also common at this time of year. Average water visibility around the, islands is reported to be between 30 and 40 feet, with maximum water temperatures ranging from 65°F to 70°F. Stormy and windy conditions tend to prevail again from October to December.

3.1.5 Geology

Both the mainsite and Sea Test Range belong to a region referred to as the Southern California Continental Borderland.

The Sea Test Range submarine geology consists of undifferentiated sedimentary rock and quaternary volcanic rock overlain with unconsolidated sediments including gravel, sand, shell rubble, silt and clay. See Appendix G for bathymetric features.

3.1.6 Physical Environment

3.1.6.1 Air Resources

NAWS Point Mugu and San Nicolas Island fall within the Ventura County Air Pollution Control District. Ventura County is designated as a federal non-attainment area for ozone; and it fails to meet the state standard for particulates (however, it meets the less stringent, federal standard for particulates). The air quality of the Sea Test Range outside the three nm limit is unclassified due to the absence of monitoring stations. The Sea Test Range west of the channel islands is outside the limits of the Ventura County Air Quality Non-attainment Area.

3.1.6.2 San Nicolas Island

San Nicolas Island is located about 65 nm south of Point Mugu mainsite and 85 nm southwest of Los Angeles. It is about nine miles long and three and a half miles wide, and encompasses an area of about 13,370 acres. The island is generally treeless, relatively flat on top and drops off sharply on the south side with a more gradual slope to the ocean on the north side. There are no permanent residents on the island, however approximately 150 people have part-time quarters assigned to them while they work there. The island has important tracking radars, instrumentation, and communications facilities which will be used during the test. The island is 100% Navy owned.

San Nicolas Island provides habitat for many species of plants and animals, of which some are unique to the Channel Islands. It is also an important breeding area for marine mammals and sea birds. To protect the wildlife, many of the beaches and coastal areas are off-limits to humans during certain times throughout the year (Reference 10).

3.1.6.3 Ocean Resources

South of Point Conception the cold, temperate waters of the California current flowing from the north meet the warm, temperate waters of the California counter current; and seasonally with the Davidson Current, both flowing from the south. The resulting gyres and eddies affect the distribution of marine

fauna leading to the presence of both cold and warm temperature species which thrive in the transition zone, and overlap in their distributions (See appendix G for current movement).

Water quality has been documented only to a limited extent. The water quality around the islands is generally good. However, chronic oil and tar pollution from non-point sources outside the marine sanctuary are reported as an important concern, along the north shore of the islands. In addition to pollution from human activities, such as oil drilling and the transportation of oil, natural oil seeps occur in the area.

3.1.6.4 Biological Resources

The area is rich in marine mammals (pinnipeds and cetaceans), seabirds, fish, shell fish, kelp, and intertidal organisms. San Nicolas, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara islands and the 6 miles offshore from them form the Channel Islands National Marine Sanctuary and Channel Islands National Park.

San Nicolas Island, for example, has 18 plant species endemic only to the Channel Islands, bird rookeries, a threatened lizard species, a native fox species, and abundant marine life including many marine mammals hauling out and tending their nurseries on the shores. Details on Channel Islands biological resources are found in Appendix F.

3.1.6.5 Endangered, Threatened, and Candidate Species

The mainsite, Sea Test Range, Channel Islands National Marine Sanctuary, Channel Islands National Park, Santa Catalina, San Clemente and San Nicolas Islands support numerous species that are protected by the Federal and the California Endangered Species Acts. At Point Mugu the extensive and relatively unspoiled lagoon, dunes, and shoreline provide habitat for the many species. The list of protected species with their designation is in Appendix D (References 8, 9, 10, 11, and 12).

3.1.7 Cultural and Historical Resources

3.1.7.1 Mainsite

The entire Ventura County coast is archeologically significant. Within the immediate vicinity of the base, evidence indicates that Native Americans occupied the Calleguas Creek watershed and the Mugu Lagoon for approximately 3,000 years before the arrival of Europeans.

3.1.7.2 Sea Test Range

Excavations in recent decades have uncovered numerous archaeological and prehistoric resources on the Channel Islands. Historic resources of the marine sanctuary include shipwrecks of significance to our maritime history, and the remains of ships and aircraft of more recent decades.

San Nicolas Island is rich in archaeological evidence. Over 500 Nicoleno Indian sites have been discovered and recorded there. Among these are villages, food processing sites, and stone quarry sites. The island is also the location of the "Cave of the Whales" one of the most spectacular cave art sites in California. It contains both pictographs and petroglyphs of local sea life: whales, sharks, porpoises and fish. These sites and all the artifacts are protected by the Antiquities Act of 1906, and the Archaeological Resources Protection Act.

3.1.8 Socioeconomic Resources

3.1.8.1 Recreation

The proposed test site is too far from the mainland coast to entertain any extensive recreational use. An occasional personal yacht may transit the area. Fishing occurs at Tanner and Cortez banks about 40 nm southeast of the splashdown area. Significant use occurs near the Channel Islands. The

predominant recreational uses around the islands are boating, sportfishing, and nature viewing. All of the islands are popular destinations for sailboats and yachts, for both one-day outings and overnight cruising. Personnel at the Channel Islands National Park have compiled statistics on usage of the islands by pleasure boaters in their own craft. According to these statistics, 140,745 recreational visitors came to the Channel Islands National Park on private boats in 1991; 129,441 visitors in 1992; 184,872 visitors in 1993; and 175,233 visitors in 1994 (Reference 13).

Island Packers, a concessionaire to the Channel Islands National Park based in Ventura Harbor, brings visitors to the islands and the surrounding areas for whale and bird watching excursions offshore, and for overnight camping. In 1991, Island Packers boats brought 11,771 visitors to the area; 27,180 visitors in 1992; 31,236 visitors in 1993; 30,730 visitors in 1994; and 26,890 visitors in 1995 (Reference 13).

Recreational anglers also use the waters surrounding the islands and throughout the Southern California Bight. A total of 68 percent of the Pacific coast recreational fishing trips in 1994, excluding Washington State salmon fishing trips, were made in southern California. Marine anglers in southern California in 1994 took 1,950,000 person trips by party/charter boat and 1,923,000 person trips by private/rental boat. The types of fish caught included Pacific mackerel, rockfish, kelp bass, barred sand bass, white croaker, Pacific bonito, and many others (Reference 14).

3.1.8.2 Commercial Fishing and Mariculture

The abundant marine resources of the area support several large year-round and seasonal fisheries. A total of 18.7 million pounds of fish were landed in the combined ports of Port Hueneme, Oxnard, and Ventura in 1992; 39.9 million pounds were landed in 1993; and 68.3 pounds were landed in 1994. Dollar value for commercial landings at these ports was 10.7 million dollars in 1992; 10.3 million dollars in 1993; and 26.7 million dollars in 1994 (Reference 14). Abalone mariculture is a relatively newly (1983) introduced and largely experimental activity. There are offshore leases for mariculture issued by California Fish and Game at San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands.

Kelp harvesting is another commercial activity undertaken near the proposed test area. Leased beds occur off San Miguel, Santa Rosa, Santa Cruz, and Santa Barbara islands.

3.1.8.3 Commercial Shipping

Commercial shipping transiting the waters off the southern California coast with port destinations from Santa Barbara to Long Beach utilize designated shipping lanes within the Santa Barbara Channel. The Santa Barbara Channel contains several major shipping routes serving the major world port area of southern California. Large vessels, including container ships and oil tankers pass through the Santa Barbara Channel at a rate of at least six per day.

3.1.8.4 Offshore Oil and Gas activities

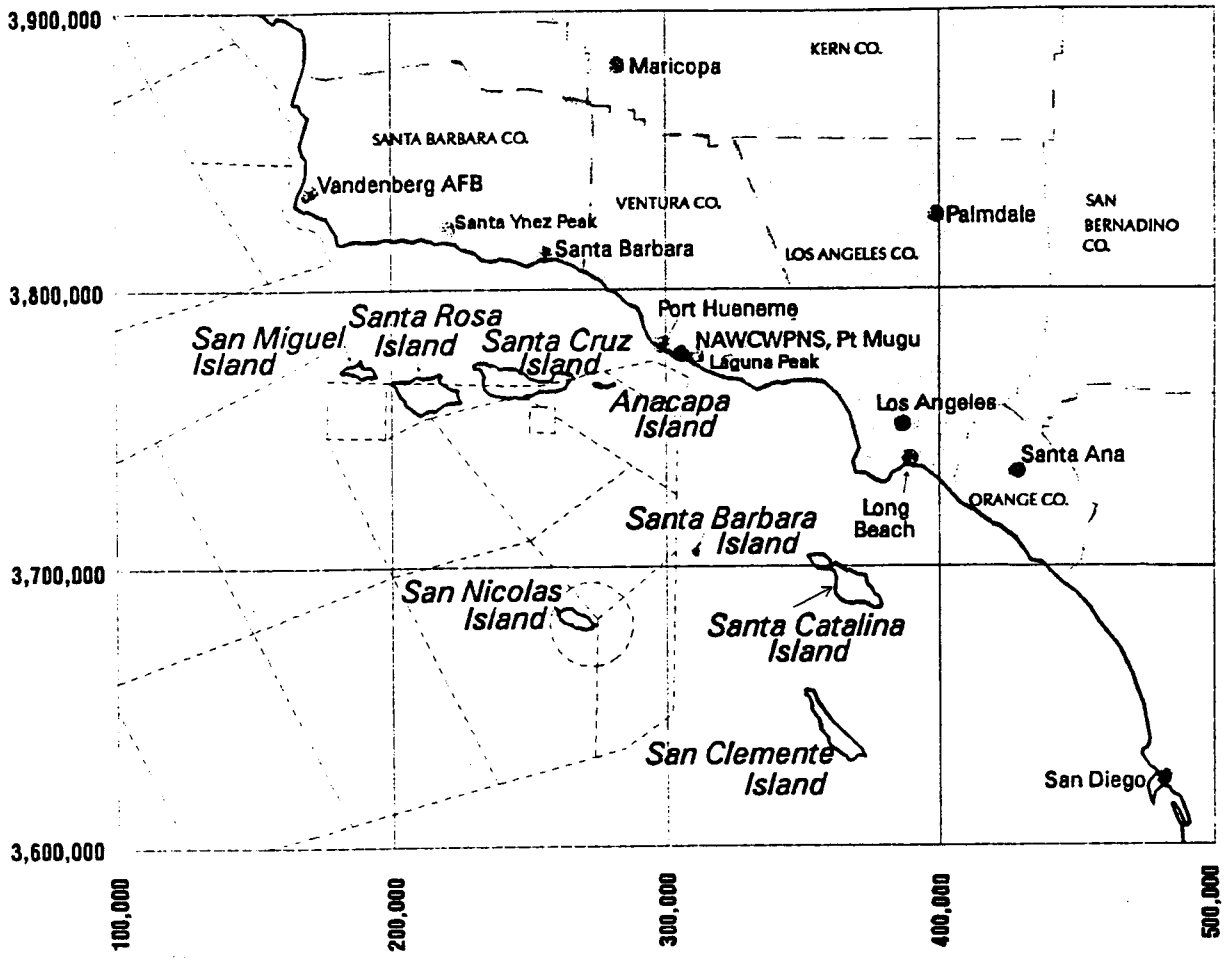
Considerable hydrocarbon development has occurred in the nearshore waters off Ventura and Santa Barbara Counties. Numerous oil platforms are present in the Santa Barbara Channel area. The federal government has jurisdiction over the Outer Continental Shelf waters seaward of the three nm limit to the edge of the continental shelf. About 1.5 million barrels of crude per day are loaded at Coal Oil Point near Santa Barbara to Los Angeles for refining (Reference 16).

3.1.8.5 Research and Education

The special ecological qualities of the marine sanctuary and its environs, including SNI attract scientific research into all areas of marine science by organizations such as the University of California, the Santa Barbara Museum of Natural History, Hubb's Sea World, Scripps Institute of Oceanography, and agencies such as the National Park Service, National Marine Fisheries Service, U.S. Fish and Wildlife

Service, Mineral Management Service, and the National Oceanic and Atmospheric Administration (Reference 16).

THE CHANNEL ISLANDS AREA



Legend

- Pacific Ocean
- Southern California Mainland and Channel Islands
- Sea Range Boundaries
- County Lines
- Major Cities and Places of Interest

N
W
E
S

Projection: Universal Transverse Mercator, Zone 11
North American Datum of 1927
100,000-Square Meter UTM grid lines shown ≈ 54 nm

Figure 3-1

4.0 ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

Impacts of the proposed action are divided here into aircraft, missile, and ground activities.

4.1 Consequences of Aircraft Flights

4.1.1 Impact of Aircraft Flights on Air Resources

The AltAir test will require two C-130 and eight NP-3D aircraft flight hours. The 10 hours of planned flights account for less than 1/10th of 1% of the annual aircraft flight hours on the Point Mugu Range. The relative increase in emissions due to the flights is negligible. AltAir program flights will be integrated into existing flight schedules without increasing the number of aircraft permanently or temporarily stationed at Point Mugu.

There is also a chance for mishaps where the worst would result in loss of an aircraft (and flight crew). As a planning document, this EA does not include the potential air emissions from an aircraft mishap because the probability of such an incident is very unlikely.

4.1.2 Noise Impact of Aircraft Flights

Noise generated by the engines of the three aircraft would be typical of and consistent with the other numerous operations on the Sea Test Range. The three aircraft are powered by four turboprop engines each, which are quieter than some of the turbojet powered aircraft which regularly frequent the Range. Any cumulative adverse noise impacts as a result of a total of about 10 hours of normal aircraft engine noise would be minimal.

As stated above, the projected aircraft flight time for the AltAir test is less than 1/10th of 1% of the flight hours annually expended at Point Mugu. Except for take-offs and landings, much of each flight will be occurring over the Sea Test Range, well away from potential receptors. The impact is negligible.

4.1.3 Impact of Aircraft Flights Upon Biological Resources

No impact except for the possibility of a bird strike, which is a very unlikely event.

4.2 Consequences of the AltAir Launch

4.2.1 Impact of Missile on Air Resources

Missile fuel combustion and launch operations constitute the largest sources of uncontrolled emissions into the atmosphere from the AltAir activities. Emission composition is determined by the type and composition of the propellant used.

The AltAir target configuration includes an SR-19-AJ-1 (modified) Minuteman II rocket motor. The combustion products from this rocket motor are given in Table 4-1 below. The missile would be ignited at an altitude of 5,000 feet and then rapidly ascend out of the atmosphere on a ballistic trajectory. The concentration of those air pollutants would be transitory and rapidly dispersed, occur above 5000 feet, far offshore, and therefore would have little adverse impact on coastal air quality conditions. See Appendix C for additional propellant characteristics.

The approximately four Range utilization hours required for the test program are about 0.1% of the entire yearly Range activity at Point Mugu. This is based upon Fical Year 1994 data of 3263 hours of Range activation and 2987 hours of Range utilization. The impact on overall range use, and therefore any associated emissions associated with normal range operations and maintenance, is very small.

.Table 4-1. Combustion Products for AltAir SR-19-AJ-1 (modified) Rocket Motor[a]

COMBUSTION PRODUCTS	*POUNDS*
Al_2O_3	3,886
CO	2,919
HCl	3,084
N_2	1,200
H_20	1,708
H_2	257
CO_2	633
Other	164
Total	13,851

a. References 17 and 18

4.2.2 Impact of Missile on Ocean Water Quality

Chemical emissions from the fired launch vehicle will primarily be into the atmosphere, and with the rocket motor empty should have minimal impact on ocean water. Expended missiles typically contain various heavy metals, plastic and rubber compounds, and would decompose at a slow rate in the marine environment (Reference 4). Other than the solid rocket fuel, listed hazardous material quantities aboard range from 41 pounds (lbs) to 1.5 milligrams (mg) (both of gas generator propellants). The propellant, explosive, pyrotechnic, and hazardous components and devices aboard the AltAir, except for seven FTS components such as batteries, will have been expended, or nearly expended upon the AltAir's reentry into the atmosphere and subsequent entry into the ocean. Because of the small quantities of hazardous materials involved, the seven unexpended devices would present no threat to marine biota. Appendix B identifies those components and devices and quantifies their potentially hazardous ingredients.

The possibilities of water pollution are associated primarily with toxic materials which may be released and are soluble in the water environment. Rocket motor propellants are the dominant source of such materials. A potential source of pollutants from the SR-19-AJ-1 (modified) rocket motor to the water environment is the 13,562 lbs of propellant. The solid propellant is primarily composed of rubber (polybutadiene) mixed with ammonium perchlorate. The ammonium perchlorate contained within the matrix of rubber will dissolve slowly (however, there is no definitive information readily available on the solubility/toxicity of the propellant material in seawater at this time) (Reference 1). The toxicity is expected to be relatively low. As a most conservative case, toxic concentrations of ammonium perchlorate would be expected only within a few yards of the source (Reference 4).

In the event of an ignition failure or other launch mishap a fueled rocket motor or portions of the unburned fuel would likely fall into ocean waters. In that case small fragments of fuel may float on the surface of the sea for a time, and some dissolution may occur, however, fragments will become waterlogged and sink (Reference 1).

The National Aeronautics and Space Administration conducted a thorough evaluation of the effects of missile systems which are deposited in seawater. This study considered sounding rockets, which are similar to the SR-19-AJ-1 (modified) rocket motor (both have solid propellant). It was concluded that the release of hazardous materials aboard missiles into seawater would not be significant. The study determined that materials would be rapidly diluted, and except for the immediate vicinity of the debris, would not be found at concentrations identified as producing any adverse effects (References 4, 19). The Pacific Ocean depth in the vicinity of the launch area is thousands of feet deep. The environmental impact from the fuel is expected to be minimal. Any area affected by the slow dissolution of the propellant would be relatively small due to the size of the rocket motor or propellant pieces relative to the quantity of water. Sensitive marine mammals are widely scattered, and the probability of one encountering or ingesting the

slowly decaying propellant or a toxic chemical/seawater solution is remote. A more detailed discussion is provided in Appendix E.

During routine operations on the Point Mugu Sea Test Range in 1995, a few hundred or more unrecoverable missiles and portions of target vehicles fell into the ocean. Since this is a one time test within the scope of existing operations on the Range, and given the large expanse of ocean in the Range and the resulting low level concentration of missile debris from ongoing operations in any one area, one time insertion of a missile with an expended rocket motor into the ocean will not by itself, nor in concert with other similar Range operations, contribute to any cumulative adverse impacts to the ocean environment

4.2.3 Shock Wave Impact

At the end of a normal flight the missile will hit the water at approximately 3400 feet per second (reference 22), which is about 3 times the speed of sound. The missile with the fuel burned out weighs 6195 lb. The fast-moving missile has a considerable amount of kinetic energy (energy of motion), which is then transferred to the ocean water upon impact. The amount of energy would be less than the chemical energy of the fuel burned, since the purpose of the fuel is to give the missile velocity and thus kinetic energy. Fuel energy is lost during the burn because of the inevitable inefficiencies of converting heat energy to motion. The kinetic energy is transformed to heat, waves, and a shock wave. The intensity and duration of the shock wave is not known, but could conceivably affect marine mammals. For example, a typical safety range of injury is 0.5 nm from 100 lb of explosive detonating underwater (reference 23).

An unfired missile may explode when it hits the water. A study done for the AltAir project predicted an explosive equivalence of 6500 lb of TNT with a 50% probability for an unfired missile falling to land in the China Lake tests. Less shock effect to explode the fuel will result from a water surface than from land. Whether the effect is enough to cause explosion is not known, but seems improbable. If explosion did occur the resultant shock wave potentially could harm marine mammals if they are within the hazard zone. The Navy ShipShock trials used high explosive charges underwater to test ship integrity; an extensive environmental analysis was accomplished (reference 23). Safety ranges used for the ShipShock trials are about 1 nm for 1200 lb of explosive and 2 nm for 10,000 lb explosive weight. So injury could be expected, on the average, if marine mammals are present in a density on the order of 0.3 - 1 mammals per square nm. The combined density of marine mammals (seals, sea lions, dolphins, and whales) as used in the ShipShock environmental analysis is about 5 animals per square mi offshore of the Channel Islands. So if animals are present at the ocean entry site at the density expected for the ShipShock trials, and an explosion occurs upon entry into the water, harm to the animals could be expected. However, mammal densities will be lower at the distance of the test from the islands. Also, the explosion would be expected take place near the water surface rather than at depth; a smaller shock wave would then result. A failed launch resulting in an explosion is unlikely; the chance of harm to marine mammals is low.

The 3875 lb sled hitting the water after parachuting from 14,000 feet altitude could also cause a shock wave, but the shock is not expected to be large since the terminal velocity would be well below the speed of sound.

4.2.4 Noise Impact of Missile

The AltAir launch presents a potential for noise impacts through the air from rocket motor engine thrust and sonic booms.

Noise generated by the launch of the AltAir would encompass a remote area of the range and be of short duration. Noise potential was considered using data from M56A-1 rocket motors (Reference 3). The M56A-1 rocket motor has a higher acoustic power than the SR-19-AJ-1 (modified) motor; therefore, sound levels from the SR-19-AJ-1 (modified) motor would be lower. The C-weighted maximum sound pressure levels for the M56A-1 are estimated to be 110-115 decibel (dB) 1 nm distant and about 85 dB 16 nm from the rocket motor (Reference 3). The loudest noise would last for a few seconds (total burn time of the

rocket motor is 67 seconds) and taper off as the vehicle moves up and out of the atmosphere (the launch vehicle will reach an altitude of about 50 km at rocket motor burn out). The noise would likely be imperceptible on the nearest land, along the central California coast and western Channel Islands more than 50 nm distant.

Sonic booms will be generated both by the front and rear of the missile during its ascent, and also during its descent after reentering the atmosphere. The sound intensity of the sonic booms decreases with distance from the source. The AltAir vehicle will exceed the speed of sound when it reaches an altitude of about 3 nm and remain in excess of the speed of sound for the balance of the flight. While high above the earth for most of the flight, there will be insufficient atmosphere to transmit sound pressure waves. The fact that the sonic booms would travel more than 30 nm before reaching land animals makes it unlikely that there would be any effect to sensitive species. Any effect to marine birds or animals that may hear the sonic boom would likely be no more than to potentially startle them. This is a small effect. The maximum sonic boom overpressures would be no greater than missile launches or supersonic military aircraft operations on military ranges (Reference 20).

4.2.5 Impact of Missile on Biological Resources

Special interest species potentially, affected are marine mammals. Potential adverse effects could occur by:

- shock wave impact or direct contact
  - with the expended missile in the splashdown area
  - with the failed missile as it or parts of it fall into the water near the launch area
  - from an explosion of unspent fuel from a failed launch
  - with the 3,875 lb sled as it enters the water near the launch area
- ingesting toxic solutions generated from the unburned propellant mixed with seawater
- ingesting pieces of unburned propellant or
- by becoming entangled with the submerged parachutes.

The taking of or injury to any marine mammal by direct impact or impact close by would be extremely remote. The splashdown of the fired launch vehicle is planned to occur in open ocean waters more than 1000 feet deep and 35 nm from the nearest land. The launch site is open ocean, more than 10,000 feet deep, in the northern portion of the Range about 75 nm from the nearest land. The launch location also results in minimal risk of hitting or otherwise harassing marine mammals should the launch vehicle, or parts of it, fall into the ocean due to launch or missile malfunction. Standard range warning and clearing procedures will check for visible large concentrations of marine mammals, or air or surface traffic in the area of the target launch, trajectory and landing. Two NP-3D aircraft will be dispatched prior to the launch and will patrol an area of potential hazard according to the Range safety plan. The aircraft will also use surface radar to search the water surface. If contacts are made and confirmed, based upon the location, heading, and speed of the contact, the Flight Safety Officer will determine whether to continue on schedule, delay the test, or postpone it until another day. The splashdown location at the terminus of the AltAir flight, about 35 nm southwest of San Nicolas Island, will keep safety hazard zones well away from any land and minimize impact to marine mammals and birds which are in greater densities near land.

The concentration and toxicity of dissolved solid rocket motor fuel in the ocean, in the unlikely event the unexpended rocket motor, or portions of it, fall into the ocean is expected to be nil and without any substantial effect. See 4.2.2 and Appendix E for further propellant in sea water toxicity discussion.

The parts of solid rocket motor propellant expelled from a destroyed or exploded rocket motor that fall into the ocean would most likely sink to the ocean floor at depths of thousands of feet. At such depths the propellant parts would be out of the way of marine mammals.

The 28 ft diameter sled parachute, weighted by the 3,875 lb sled will descend to the ocean floor after entering the water. The two 43.5 ft missile parachutes, weighing 200 lb each, are also expected to descend to the ocean floor weighted with the 116 lb weight of their attachment hardware. The parachutes are a standard ribbon type used with the B-52 airplane to brake it upon landing. They are modified with a 94 foot long Kevlar reefing line. The nylon of which the parachutes and shrouds are comprised is not toxic or chemically harmful. The ribbons are 1000 lb test, yellow two inch wide Mil-T-5606 nylon composed of polyamide prepared from hexamethylene diamine and adipic acid or its derivative with a minimum melting point of 244 degrees Celsius.

Entanglement of a marine mammal in a parachute would be very unlikely since the mammal would have to swim into it or not detect the parachute from above it as it sinks. Near the surface the parachute would be seen and could be avoided. Anyway, the chance of a mammal being in the same area and having physical contact with the chute is remote.

4.2.6 Socioeconomic Resources

Limited, short term increases in personnel at NAWCWPNS Point Mugu (administrative office space, primarily) are expected for a period of a few months prior the live drop. The drops at China Lake are preceded by missile build-up and servicing at NAWS Point Mugu. A few desks will be manned by contractor personnel at NAWS Point Mugu during that time. During the two-week period around the live launch up to 50 contractor and government support personnel could temporarily be present. No increase in security, fire, medical, or related services is anticipated; and no potentially adverse effects upon socioeconomic resources attributable to the AltAir test are expected.

This project will have no discernible impact upon minority and low income populations (Reference 21).

4.3 Cumulative Impacts

Combined air emissions from the AltAir test operation, as demonstrated above, will have minimal cumulative impacts. The test is outside California waters and not in an area of "non-attainment" for air quality parameters. A conformity determination with the Clean Air Act will not be required.

4.4 Safety and Clearance Procedures

The test will be conducted according to Navy and Range policies, instructions, and Standard Operating Procedures; and local, regional and federal environmental laws and regulations. Marine mammals are expected to be present in the test area. Normal Range clearance procedures will be utilized before the launch. Hazard patterns and clearance procedures will be detailed in a safety plan for the test to insure that the public, personnel on San Nicolas and the other islands, and those participating in the test are protected. Surface radars and aircraft will survey for air and surface contacts which are tagged, tracked, and identified. Contacts such as planes and boats will be requested to leave the hazard zone area. Visible concentrations of marine mammals will be noted. If a concentration of marine mammals or a whale is found in the splashdown area, a recommendation to delay or change the test to avoid the animals will be made to the Range Officer.

4.5 Relationship Between Local Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity.

The U.S. Navy and DoD benefit from this action by gaining knowledge of AltAir target concept development potential that cannot be gained through other methods. This information will be used to direct programmatic research and development efforts, supporting the Navy's efforts to produce a viable, upgraded, and deployable short range air-intercept missile capable of defending against ballistic missile threats.

Short term uses require the commitment of petroleum products to power the aircraft and ground vehicles required to prepare and conduct the test. Since this is a one time test utilizing existing missile components no mineral resources will be used to manufacture the missile or rocket motor propellant. Short term users also require reserving the Sea Test Range to conduct the test.

Implementation of this project does not preclude future generations from employing the Sea Test Range or existing test facilities, as the testing will not commit resources permanently to a long term pattern of use.

5.0 IRRETRIEVABLE COMMITMENTS OF RESOURCES

Implementation of the proposed test under normal operations will result in the irreversible and irretrievable use of the following:

1. Fossil fuels in jet aircraft (JP-8) and supporting ground vehicles (diesel and gasoline) used in preparing the ballistic target for the test activities.
2. Small amounts of materials, chemicals, and energy required by the contractors to maintain, clean, and prepare the test articles for use in the demonstration test.

The use of the SR-19 rocket motor for the AltAir target from existing decommissioned motors from other DoD programs would reduce the irretrievable commitment of resources for the manufacture and processing of a new rocket motor system. Guidance section and motor adapter components required to modify the government furnished major missile components would have very minimal resource requirements for producing the AltAir target.

6.0 PERMITS AND REGULATORY COMPLIANCE

U.S. Fish and Wildlife Service (USFWS) enforces the Federal Endangered Species Act. A NAWS Point Mugu biologist made an inquiry with USFWS about this project, describing AltAir and its impacts. USFWS stated that they no concerns about this project. The test takes places primarily in international waters with no listed species involved.

NMFS enforces the Marine Mammal Protection Act and protects federally listed marine mammals. The NAWS Point Mugu Altair Environmental Coordinator and the SNI Biological Resource Manager met with the National Marine Fisheries Service, briefed their specialist on this project and the contents of the EA, and requested feedback on any concerns and requirements by NMFS. NMFS stated there was no need for a letter of authorization or other permit for the project as described. No authorization for harrassment nor for take of animals is needed for the AltAir demonstration shot because there is only an extremely low probability of any impact upon marine mammals. However, NMFS stated, this applies only to the one-time shot, and a larger scale program of testing would need more detailed analysis and more involved coordination on impacts.

No stationary sources of air emissions will be employed during this test. Fuel use at NAWS Point Mugu is in accordance with Federal, State, and local regulations.

The California Coastal Commission administers the California Coastal Zone. There is no effect on the coastal zone or its resources; no coastal consistency determination nor permitting is needed.

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8.0 REFERENCES

1. Department of the Air Force, Los Angeles Air Force Station, Battelle Environmental Management Operations for Headquarters, Space Systems Division USAF, 1989. "Pegasus Air-Launched Space Booster Environmental Assessment."

2. Headquarters Space Systems Division, Los Angeles Air Force Base, CA, April 1992. "Environmental Assessment for the Taurus Standard Small Launch Vehicle Program at Vandenberg AFB, CA."

3. U.S. Army Space and Strategic Defense Command, Huntsville, Alabama, January 1994. "Theater Missile Defense Hera Target Systems Environmental Assessment."

4. U.S. Army Space and Strategic Defense Command, Huntsville, AL, Nov 1994. "Theater Missile Defense Extended Test Range Final Environmental Impact Statement."

5. Naval Air Warfare Center, Weapons Division, China Lake memo 5090 823E00D(C8305/328), 14 Nov 1995. "Determination of Continuing Activity for the Proposed Air Ballistic Target Short Range Flight Tests."

6. National Air Intelligence Center, OH, July 1996. "Program Requirements Document, AltAir Short Range Flight Test Demonstration."

7. NAWS Point Mugu, September 1992. "AICUZ, Air Installation Compatible Use Zone Study."

8. Naval Air Warfare Center Weapons Division, Point Mugu, CA, May 1996. "Draft Point Mugu Range Management Plan."

9. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Sanctuary Programs Division, September 1983. "Channel Islands National Marine Sanctuary Management Plan."

10. NAWCWD Point Mugu, October 1993. "San Nicolas Island and Santa Cruz Island Site Manual."

11. Naval Facilities Engineering Command, Western Division, San Bruno, CA, 1986. "Master Plan, Pacific Missile Test Center, Point Mugu, CA."

12. Mark Lowry, National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, CA., 1995. "Counts of Northern Elephant Seals (1988-1994) and California Sea Lions (1990 - 1984) at San Nicolas Island, CA"..

13. Ms. Carol Spears, Channel Islands National Park Public Information Officer, Ventura, CA, April, 1996. Personal conversation with Ms. Alice Green, TETRA TECH Santa Barbara.

14. National Marine Fisheries Service, August 1995. "Fisheries of the United States, 1994, Current Fishers Statistics No. 9400."

15. Petty Officer Chase, Port Hueneme, CA Coast Guard Station, 25 July 1996. Personal phone call with K.L. Graham, HTS Inc., Camarillo, CA.

16. Mr. Doug Anthony, Energy Specialist, Energy Division, County of Santa Barbara, 1994. Personal conversation with Mr. Paul Owens, NAWCWD, China Lake, CA.

17. Chemical Propulsion Information Agency, May 1964. Unit No. 1021, M2, Page b, "Thermodynamic Properties of Combustion Products."

18. AeroJet-General Corporation, 1 Aug 1966. Minuteman Data Book, WS-133B, Revision 2, Section 4.0, Stage II Motor, Major Topic 4.3, "Specification Data and Performance, Combustion Product Composition."

19. National Aeronautics and Space Administration, August 1994. "Draft Supplemental Environmental Impact Statement for the Sounding Rocket Program."

20. U.S. Army Space and Strategic Defense Command, Huntsville, Alabama, March 1994. "Theater High Altitude Area Defense (THAAD) Initial Development Program Environmental Assessment."

21. Office of the President of the United States of America, 11 February 1994. "Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations."

22. Space Vector Corporation, 8 October 1996. Letter to NAIC: "AltAir Impact Velocity".

23. NMFS, October 1993. "Environmental Assessment on Proposed Regulations Governing the Taking of Marine Mammals Incidental to the Underwater Detonation of Conventional Explosives in the Offshore Waters of the Outer Test Range of the Naval Air Warfare Center, Point Mugu, California"

24. Space Vector Corporation, Chatsworth, CA, (for Xontech Inc./NAIC), Sept. 20, 1994. "Flight Safety Report for the ALTAIR Target Vehicle", Contract No. 4-02992-021-2/HG1-95-65, SVC Report No. 1746-R21.

25. Coleman Research Corporation (for U.S. Army Space and Strategic Defense Command CSSD-TM-T), Huntsville AL, May, 1994. "SR-19 Destruct Debris Model, Action Item # 240C1"

26. Office of the President of the United States of America, 4 January 1979. "Presidential Executive Order 12114, Environmental Effects Abroad of Major Federal Actions" 44 FR 1957

27. Xontech Corporation (for NAIC), Englewood, CO, 2 July 1996. "AltAir Ballistic Target Short Range Flight Test Demo Range Selection Study".

28. TRW Systems Integration Group (for USAF Space and Missile Systems Center), Albuquerque, NM, 17 May 1996, "AltAir SR-19 Ground Impact"

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10.0 APPENDICES

Appendix A Proposed AltAir Short Range Flight Test Demonstration Schedule of Events

Appendix B Specific AltAir Description

Appendix C Detailed SR-19-AJ-1 (modified) Rocket Motor Propellant Composition and Emission Data

Appendix D Protected Species in the Project Region

Appendix E Information About Rocket Motor Propellant in Seawater

Appendix F Biological Resources

Appendix G Geology

APPENDIX A
Proposed AltAir Short Range Flight Test Demonstration Schedule of Events

The planned schedule of events for the AltAir development and demonstration program is presented in Figure A-1.

EVENT	CY1996 J	F	M	A	M	J	J	A	S	O	N	D	CY1997 J	F	M
System Engineering and Design				X	X	X	X	X	X						
Vehicle Development and Fabrication							X	X	X	X	X	X			
System Integration								X	X	X	X	X	X		
Test Drop P-1 (separation)									^						
Test Drop P-2 (backup)												^			
Test Drop S-1 (systems)												^			
Test Drop F-1 (live fire)													^		
Range Data Processing/Analysis/Distribution									X	X	X	X	X	X	X
Preparation of C-130										X	X	X	X		

Figure A-1. AltAir Demonstration/Development Program Schedule of Events

APPENDIX B
Specific AltAir Description

The physical characteristics and the launch configuration of the AltAir are shown in Tables B-1, B-2, and Figure B-1 respectively.

Table B-1. AltAir Physical Characteristics

Length: 331.81 in.
Diameter (max): 60.534 in. (skirt diameter.)
Propulsion System: SR-19-AJ-1 (modified) rocket motor
Guidance System: SVC LN-100G IMU/GPS, SRI SC-2B computer
Launcher Type: N/A
Explosive Type/Category: DoD Class 1.1A/1.2A
Launch Weight: 19945.0 lbm
Burn Out Time: 67.0 sec

Other System Characteristics:

Nose Cone Weight (includes ballast)	3535.0 lbm
GCS Module Weight	280.0 lbm
Rocket Motor Control System	160.0 lbm
Telemetry System	10.0 lbm
Modified MMII 2/3 Interstage	230.0 lbm
Rocket Motor Weight	15580.0 lbm
Skirt	150.0 lbm
Total Liftoff Weight	19945.0 lbm

Table B-2. AltAir Hazardous Materials (Explosives/Propellants/Pyrotechnics/Batteries)

Item Description	Quantity	HM Wt (total)	Hazardous Material (HM)
Battery Assembly, FTS	2	9.7 lb	Nickel Cadmium Dry Cell
Battery Assembly, Nozzle Control Unit	1	700 cc	Potassium Hydroxide
Battery Assembly, Ordnance	2	23.3 lb	Rechargeable Nickel-Cadmium
Battery Assembly, System	2	23.3 lb	Rechargeable Nickel-Cadmium
Detonating Cord, FTS Flexible Contained	2	1.5 grams(gm)	Cup: HNS-1; Cord: HNS-2
Detonator, FTS Safe and Arm	2	236 mg	HNS-1, Lead Azide, Zirconium-Potassium Perchlorate
Explosive Bolt Parachute Release Device	5	6.0 gm	Potassium Perchlorate, Titanium, Lead Azide, Pentaerythritol Tetranitrate
Ignitor, Rocket Motor	1	3.4 lbs	ANB-3066 propellant
Ignitor, Rocket Motor Roll Control Gas Generator	1	Prime: 16 mg Load: 1.25 lbs	Boron Potassium Nitrate DDP - 80 Propellant

Item Description	Quantity	HM Wt (total)	Hazardous Material (HM)
Initiator, Rocket Motor Ignitor	1	60 gm	Boron Potassium Nitrate Pellets/Powder
Linear Shaped Charge, FTS	1	104.6 gm	RDX in Aluminum Jacket
Propellant, NCU Battery Assembly Gas Generator	1	2.35 gm	Nitrocellulose Nitro-glycerin
Propellant, Rocket Motor Roll Control Gas Generator	1	41 lbs	OMXD 453D Composition. Sustainer: Molded Ammonium Nitrate. Secondary: Boron Potassium Nitrate
Propellant, SR-19-AJ-1 (modified) Rocket Motor Solid	1	13,562 lbs	ANB-3066 9,966 lbs - Ammonium Perchlorate 2,048 lbs - Aluminum 1,638 lbs - Polybutadiene Binder
Squib, Missile Restraint Cable Cutter	6	720 mg	Zirconium-Potassium Perchlorate, Lead Azide
Squib, NCU Battery Assembly	2	180 mg	Winn-Star 4408-2, CuO_2, Silicone Powder, PbO_2
Squib, Ordnance Battery	1	90 mg	Win-Starr 666, CuO_2, Sl, PbO_2 Powder
Squib, Rocket Motor Roll Control Gas Generator	2	Prime: 90 mg Load: 66 mg	Zirconium-Nickel Alloy, Potassium Perchlorate Lead Thiocyanate, Potassium Perchlorate
Squib, Rocket Motor Safe & Arm Device	2	333 mg	Zirconium-Nickel Alloy, Potassium Perchlorate
Squib, Rocket Motor Thrust Vector Actuator Pressure Vessel	2	Prime: 16 mg Load: 522 mg	Zirconium-Nickel, Potassium Perchlorate Polyvinyl

The AltAir will be carried aboard the C-130 Aircraft while secured to a special cradle/sled/dock airborne support equipment configuration as shown in Figure B-2. In addition to the AltAir airborne support equipment, several pieces of electronics equipment mounted in consoles which are mounted on pallets will be carried aboard the C-130 to support the test. This palletized air support equipment is described as follows:

a) Navigation Console - A ruggedized International Business Machines, Inc. (IBM) or clone computer terminal with a Space Vector Corporation (SVC) designed communications card and terminal software package (serial data interface allows SVC terminals to communicate with one another). This terminal communicates directly with the vehicle navigation system through the umbilical cable. It can send and receive serial data and monitors the pulse code modulation bit stream and decodes and displays navigation parameters.

b) Power and Control Console - Console includes a ruggedized IBM or clone computer, monitor, power supply and power distribution module, which distribute DC power to the launch vehicle.

c) Telemetry Console - The telemetry console is required aboard the aircraft to aid in the final go/no go decision. The telemetry system allows a check of the system from the signal sources through the Pulse Code Modulations encoder. If telemetry transmission is possible while on the aircraft, then the S-Band receiver will be added to the telemetry console for final checkout of the transmitter and antenna on the drop vehicle. The telemetry console is a standard six foot high rack.

d) Communication Console - The communications console consists of an Radio Frequency link for communication between the launch crew aboard the aircraft and the ground personnel. The console also contains the intercom master station.

e) Flight Termination System Console - The panel is used by missile flight safety to establish control authority over the FTS. The panel is used turn FTS receivers on and off and monitor FTS battery voltages. The panel also provides for command and monitoring of the electrical Safe/Arm and monitoring of the electro-mechanical Safe/Arm. The electrical Safe/Arm will be armed while the vehicle is still inside the aircraft. The electro-mechanical Safe/Arm will be armed after the vehicle is deployed from the aircraft. The arming is done by the navigation system's timer which is initiated by the Booster Guidance System umbilical disconnect.

A schematic arrangement of the Palletized Airborne Support Equipment is shown in Figure B-3.

Additional peculiar ground support equipment will be used to support the live firing test and is listed as follows:

a) SR-19-AJ-1 (modified) Spreader Bar with Lifting Sling

b) Module Lifting Rail Set

c) Module Lifting Spreader Bar

d) Horizontal Handling Cart

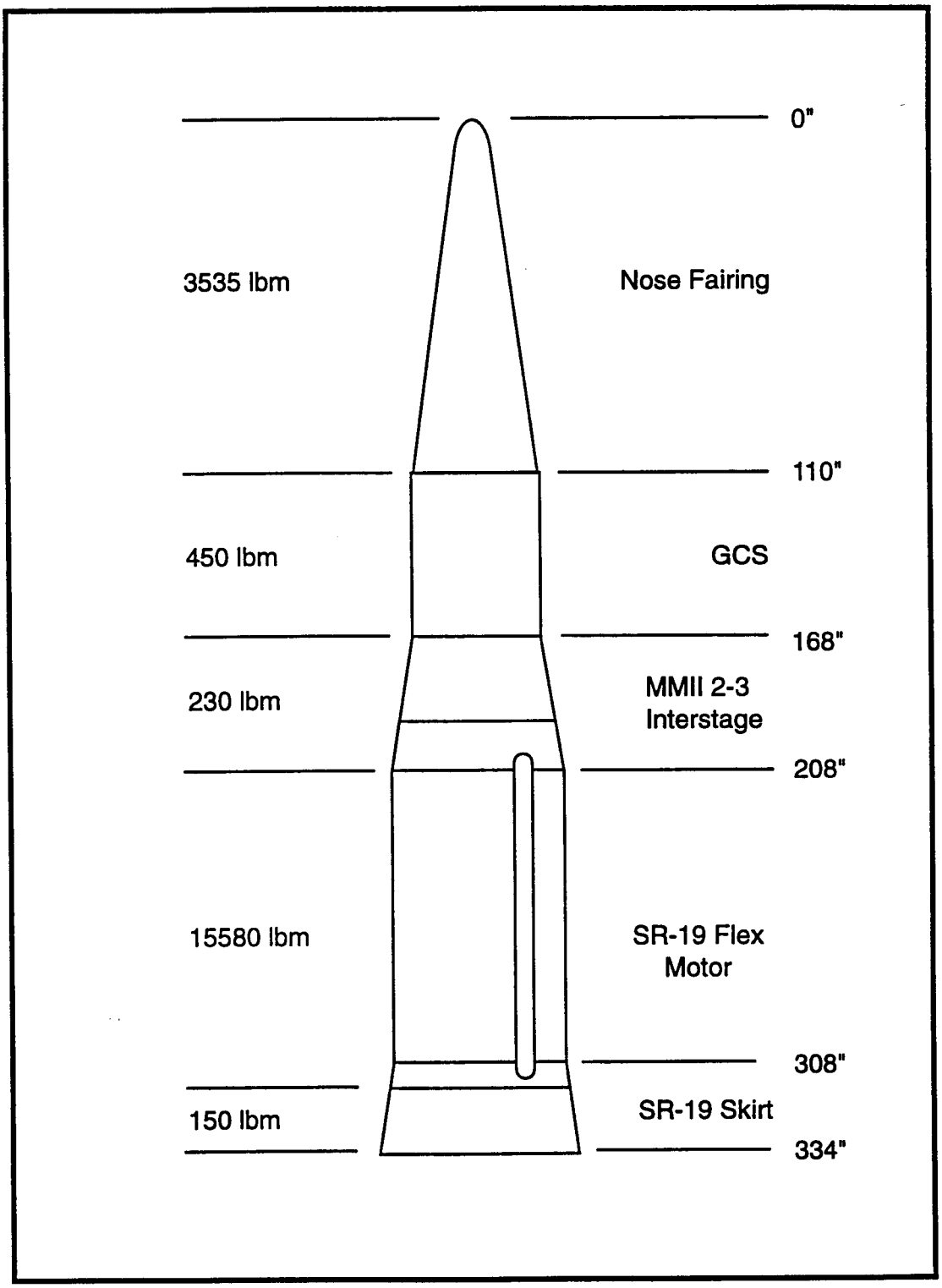

Figure B-1. AltAir Ballistic Target Launch Configuration

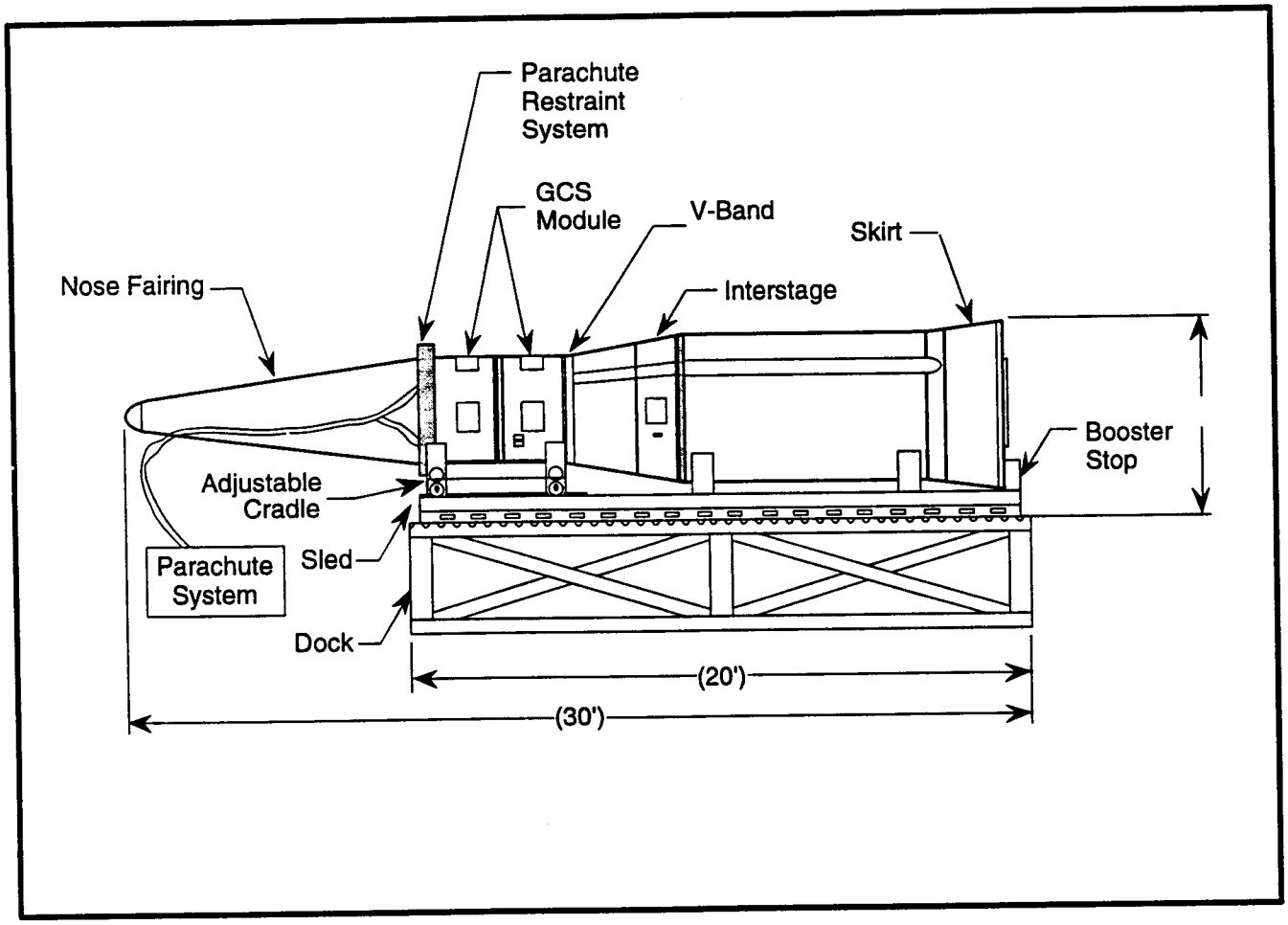

Figure B-2. AltAir Ballistic Target Airborne Support Equipment Configuration.

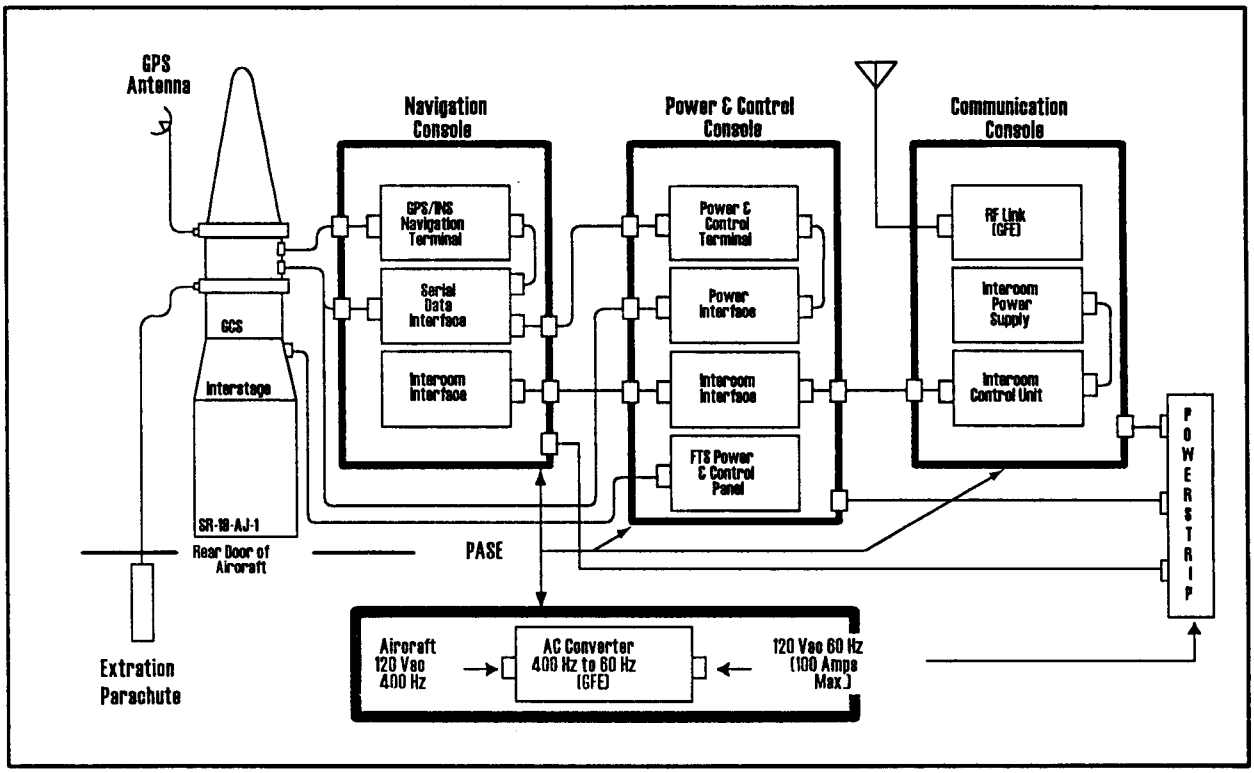

Figure B-3. Palletized Airborne Support Equipment

APPENDIX C
Detailed SR-19-AJ-1 (modified) Rocket Motor Solid Propellant Composition and Emission Data

BACKGROUND

The SR-19-AJ-1 (modified) motor used in the AltAir demonstration was manufactured by AeroJet General Corporation sometime in the late 1960's and was intended to be used as the second stage booster in the Minuteman Wing VI (also known as the Minuteman II) Intercontinental Ballistic Missile. The actual age of the rocket motor will depend upon the date of manufacture of the rocket motor used for the test. The SR-19-AJ-1 (modified) rocket motor is loaded with ANB-3066 solid propellant. ANB-3066 propellant significant data is described in the following tables.

Table C-1. Propellant Data[a]

Manufacturer	AeroJet-General Corporation
ICC Classification	Class B
Military Classification	Class 2
Type	AP/PB(c.t.)/Al
Established temperature range	-40 to 180° F
Density at 77°F	0.0638 lb/in^3
Pressure range at 77°F	400 to 1000 psia
Flame temperature at 1000 psia	5836°F
Storage life at 77°F	>3 years
Related burning rate range	0.30 to 0.39 in./sec
Propellant Specific Impulse - I_{spd}	287.4 lbf-sec/lbm
Burning rate at 1000 psia and 77°F	0.38 in./sec
Tensile modulus at 77°F	396 pounds per square inch
Tensile elongation at 77°F	44%

Table C-2. Propellant Composition[a]

Constituent	Trade Name	Source	Function	Nominal Wt%
Ammonium perchlorate	Class I	American Potash	oxidizer	73.00
Carboxy terminated Polybutadiene	Butarez-CTL Type II	Phillips Petroleum	binder	8.56
Polybutene	Oronite 6	Oronite Co.	plasticizer	3.00
Aluminum	Class 6	ALCOA	fuel	15.00
Butylene imine derivative of trimesic acid	HX-868, BITA	3M Co.	crosslinker	0.44

Table C-3. Thermodynamic Properties of Propellant[b]

Thermodynamic Properties of Propellant	Calculated	Experimental
Heat of explosion, ΔH_{ex}(cal/gm)	-1502.0	
Heat capacity, c_p (cal/gm-°C) from 60 to 26°C		0.314
Heat of formation, ΔH_f (cal/gm) at 298°K	-438.54	NA

Empirical formula (gm-atoms/100gm): $C_{0.8647}H_{3.8818}O_{2.4952}N_{0.6246}Al_{0.5561}Cl_{0.6212}$

Table C-4. Thermodynamic Properties of Combustion Products

Component	Chamber	Exit Equilibrium Composition (moles/100gm)
HCL	0.5000	0.6167
N_2	0.3103	0.3123
H_2O	0.7275	0.6913
H_2	0.8784	0.9368
O_2	0.0013	
O	0.0043	
OH	0.0444	0.0007
Cl	0.0477	0.0039
NO	0.0041	
H	0.1255	0.0082
CO	0.7863	0.7599
CO_2	0.0783	0.1048
AlCl	0.0128	
$AlCl_2$	0.0291	0.0003
Al_2O_3	0.2563	0.2779
Total gases	3.5520	3.4350

Table C-4. Thermodynamic Properties of Combustion Products (cont)[b]

Properties of Combustion Products	Chamber	Frozen Exit Composition	Equilibrium Exit Composition
Pressure, P (psia)	1000	14.7	14.7
Temperature, T (°K)	3498		2163
Temperature, T (°F)	5836		3434
Mean heat capacity of gases, c_g(cal/gm-°K)			0.607
Mean molecular weight of gases, M_g (gm/gm-mole)	28.155		29.114
Combustion gas specific heat ratio, γ			1.1285

Table C-5. Physical Properties[c]

Propellant density, ρ_P, at 77°F	0.638 lb/in^3
Coefficient of linear thermal expansion, α, from -68 to 30°F	5.13x10^{-5}in/in-°F
Coefficient of volumetric thermal expansion, β, from 79 to 140°F	1.61x10^{-4} in^3/in^3-°F
Thermal conductivity, k, from 80 to 180°F	0.257 BTU/hr-ft-°F
Second order transition temperature, T_g	-80 °F
Poisson's ratio, ν, from 80 to 180 °F	0.50

Table C-6. Stability and Sensitivity[c]

Impact sensitivity with 2 kg weight @<10 cm:	no fire
@ 16-20cm:	50% fire
Tester type:	Bureau of Mines

No toxicity hazards in storage and/or use.
Unconfined sample stable at 180°F for 48 hours in oven.
Negative to #8 blasting cap.
Burns without explosion.
Wood block test. Negative to #8 blasting cap and with 5 gm tetryl booster, 0 attenuation.
Unconfined vigorous burning without explosion.[a]

[a]Chemical Propulsion Information Agency M2, Unit No. 1021, Page 2, May 1964.
[b]Chemical Propulsion Information Agency M2, Unit No. 1021, page b, May 1964.
[c]Chemical Propulsion Information Agency M2, Unit No. 1021, page c, May 1964.

Appendix D. Protected Marine Species in the Project Region [a]

	Common Name	Status[b]	Abundance/Use[c]
Reptiles			
Caretta caretta gigas	Pacific loggerhead (turtle)	FT	Ra, SU-F, V, N
Chelonia mydas agassizi	Pacific green sea turtle	FT	Ra,SU-F,V, N
Dermochelys coriacea schlegelii	Pacific leatherback (turtle)	FE	0, P, Re, N
Eretmochelys imbricata bissa	Pacific hawksbill (turtle)	FE	Ra, SU-F, V, N
Lepidochelys olivacea	Olive ridley (turtle)	FT	0, SU-F, V, N
Mammals			
Arctocephalus townsendi	Guadalupe fur seal	FT, ST	Ra, P, V, N
Balaena glacialis	Black right whale	FE	0, W, V, N
Balaenoptera acutorostrata	Minke whale		0, P, Re, N
B. borealis	Sei whale	FE	0, P, Re, N
B. edeni	Bryde's whale		Ra, SU-F, V, N
B. musculus	Blue whale	FE	U,P,R,N
B. physalus	Finback whale	FE	0, P, R, N
Berardius bairdii	North Pacific bottle-nosed whale		Ra, W, V, N
Callorhinus ursinus	Northern fur seal		U,P,V,N
Delphinus delphis	Pacific common dolphin		C, P, Re, B
Enhydra lutris nereis	Southern sea otter	FT	C, P, Re, B
Eschrinchtius robustus	Gray whale	FE	U, P, Re, N
Eumetopias jubatas	Northern sea lion	FT	Ra, P, V, N
Feresa attenuata	Pygmy killer whale		AC, SU, V, N
Globicephala macrorhynchus	Short-finned pilot whale		U, P, Re, B
Grampus griseus	Risso's dolphin		U, P, Re, B
Kogia breviceps	Pygmy sperm whale		O,P,Re,B
K. simus	Dwarf sperm whale		0, P, Re, B
Lagenorhynchus obliquidens	Pacific white-sided dolphin		C, P, Re, B
Lissodelphis borealis	Northern right-whale dolphin		C, P, Re, B
Megaptera novaeangliae	Humpback whale	FE	U, P, Re, N
Mesoplodon carlhubbsi	Arch-beaked whale		O,P,Re,B
M. ginkgodens	Ginkgo beaked whale		O,P,V,N
M. hectori	Hector's beaked whale		Ra, SU-F, V, N
M. steinegeri	Stejneger's beaked whale		Ra, W, V, N
Mirounga angustirostris	Northern elephant seal		C, P, Re, B
Orcinus orca	Killer whale		U, P, Re, B
Phoca vitulina richardsi	Pacific harbor seal		U, P, Re, B
Phocoena phocoena	Harbor porpoise		0, W, V, N
Phocoenoides dalli	Dall's porpoise		U,P,Re,B
Physeter catodon	Sperm whale	FE	O,P,Re,N
Pseudorca crassidens	False killer whale		U, P, Re, N
Stenella attenuata	Pantropical spotted dolphin		Ra, SU, V, N
S. coeruleoalba	Striped dolphin		0, P, Re, B
S. longirostris	Long-snouted spinner dolphin		Ra, SU, V, N
Steno bredanensis	Rough-toothed dolphin		Ra, SU, V, N
Tursiops truncatus	Bottle-nosed dolphin		0, P, Re, N
Zalophus californianus	California sea lion		C,P,Re,B
Ziphius cavirostris	Goose-beaked whale		O,P,Re,B

[a] 50 CFR 17; CDFG (1990); Steve Schwartz, Personal Communications. February 26, 1993.

[b] ST = State threatened; FT = Federal threatened; FE = Federal endangered; listed mammals protected by the Marine Mammal Protection Act of 1972.

[c] AC = Accidental, only reported once or twice; B = Breeding; C = Common, certain to be seen in correct habitat; F = Fall; N = Nonbreeding; O = Occasional, reported only a few times a year; P = Permanent; Ra = Rare, generally not seen every year; Re = Resident; U = Uncommon, present but not certain to be seen; SU = Summer; V = Visitor; W = Winter.

APPENDIX E
Information About rocket Motor Propellant in Seawater

INTRODUCTION

There are three scenarios in which unburned rocket motor solid propellant may mix with the ocean waters:

Scenario one. Following normal deployment of the live launch drop and release of the parachute, the rocket motor may fail to ignite thereby allowing the entire AltAir to free fall from 5,000 feet and impact the water fully loaded with unburned propellant.

Scenario two. Following deployment and ignition of the live launch target, it will be armed for destruction by the Flight Termination System (FTS). Should the target fly off course, the Flight Termination System will detonate and render the rocket motor non-propulsive such that the target will lose velocity, most likely tumble and eventually fall into the ocean. The rocket motor fuel will continue to burn in the atmosphere and depending upon the altitude of the target at the time of FTS initiation, will most likely burn out before the target impacts the ocean; however, in the worst case situation, there may be pieces of unburned propellant ejected from the rocket motor casing at FTS initiation, or unburned propellant will be ejected due to rocket motor breakup upon impact with the water.

Scenario three. Emergency landing and subsequent sinking of the C-130 in the ocean prior to deployment of the AltAir. This would allow the fully loaded AltAir rocket motor to sink to the bottom of the sea, most likely intact without ignition prior to sinking even though the landing may be a catastrophic uncontrolled crash.

Analysis

The maximum amount of unburned rocket motor propellant in the ocean would occur under scenarios one and three assuming that the impact of the rocket motor with the water in scenario one would not result in an explosion of the propellant.[a] Should such an explosion occur, it is expected that much of the propellant would be thrown free of the explosive combustion center in an unburned state.[a] Some propellant may be ignited by the explosion and also be thrown free of the explosive combustion center, but because of the course grain of the ammonium perchlorate and the lack of a confined high temperature combustion chamber, will likely burn at a substantially lower temperature, or cease to burn at all[a]. Small fragments of fuel may float on the surface of the sea for a time, and some dissolution may occur, however, fragments will become waterlogged and sink.[a]

The potential to impact water quality in the ocean from expended rocket motors or failed launches is expected to be minimal. The possibilities of water pollution are associated primarily with toxic materials which may be released and are soluble in the water environment. The 13,600 lbs of propellant in the SR-19-AJ-1 (modified) rocket motor is the dominant source of potentially toxic materials. There are also 37 other devices and components in the missile that contain potentially toxic materials. The quantity of material in each device/component is relatively small, ranging from 41 lbs to 1.5 mg, and each device is generally sealed and because of the small quantities of hazardous materials involved, would present no threat to any marine biota even if they did rupture upon rocket motor impact with the water. All but seven of the devices (all part of the FTS) will be expended or destroyed prior to entry into the water of a normally functioning missile. The devices/components and their hazardous materials are identified and quantified in

Appendix B. Potential sources of pollutants from the SR-19-AJ-1 (modified) rocket motor propellants to the water environment are given below:

CONSTITUENT	*FUNCTION*	*NOMINAL WT %*
Ammonium perchlorate	oxidizer	73.00
Aluminum	fuel	15.00
Carboxy Terminated Polybutadiene	binder	8.56
Polybutene	plasticizer	3.00
Butylene imine derivative of trimesic acid	crosslinker	0.44

Solid propellants are primarily composed of plastics or rubbers such as polyvinylchloride, polyurethane, polybutadiene, polysulfide, etc., mixed with ammonium perchlorate. The plastics and rubbers are generally considered nontoxic and, in the water, would be expected to decompose at a very slow rate and disperse at a very high rate.

The ammonium perchlorate found in solid propellants contained within the matrix of rubber or plastic will dissolve slowly (however, there is no definitive information readily available on the solubility/toxicity of the propellant material in seawater at this time[a]). The toxicity is expected to be relatively low. As a most conservative case, toxic concentrations of ammonium perchlorate would be expected only within a few meters (yards) of the source.[b] The projected launch and splashdown take place over water thousands of feet deep. It is not known if the mixing rate would still be high enough to dilute and disperse products to less toxic levels as rapidly as they are released. However, the area affected would be relatively small due to the size of the rocket motor or propellant pieces relative to the quantity of water, and the environmental impact is expected to be minimal.[a]

The National Aeronautics and Space Administration conducted a thorough evaluation of the effects of missile systems which are deposited in seawater. This study considered sounding rockets, which are similar to the proposed AltAir missile system. It concluded that the release of hazardous materials aboard missiles into seawater would not be a significant amount.[b] The study also determined that materials would be rapidly diluted, and except for in the immediate vicinity of the debris, would not be found at concentrations identified as producing any adverse effects.[b] Sensitive marine mammals are widely scattered and the probability of a threatened or endangered species encountering or ingesting the slowly decaying propellant or a toxic chemical/seawater solution is remote.

Cumulative Impacts

As potential for toxic concentrations is expected to be small and the effects would be very localized, the potential for cumulative impacts is expected to be nil.

[a]Department of the Air Force, Los Angeles Air Force Station, 1989. Pegasus Air-Launched Space Booster Environmental Assessment. Battelle Environmental Management Operations for Headquarters, Space Systems Division USAF.

[b]National Aeronautics and Space Administration, 1973. Final environmental Impact Statement for National Aeronautics and Space Administration Office of Space Science, Sounding Rocket Program. July.

APPENDIX F
Biological Resources

The primary biological resources nearest the AltAir launch and landing site are in the ocean and on and around the islands off the southern California coast

Pinnipeds

The dramatic recovery of pinniped populations in the Channel Islands since the end of the fur trade has been documented through several systematic studies. The area provides habitat for breeding populations of five species of pinnipeds: California sea lion, Stellar sea lion, northern fur seal, northern elephant seal, and harbor seal. The Guadalupe fur seal is an occasional visitor to the area. All six species are found in the sanctuary area at different times of the year, feeding on the abundant fish and invertebrate resources of the island shelves, or hauling out on rocks and beaches. Pinniped species' diversity and concentration varies across the sanctuary. The greatest numbers occur around the western tip of San Miguel Island, the only location in the United States, and one of the very few in the world, where breeding populations of five species of pinnipeds can be found. Three species, California sea lions, northern elephant seals, and harbor seals breed at Santa Barbara Island. Harbor seals also breed on Santa Rosa, Santa Cruz, San Nicolas and Anacapa islands.[a]

California sea lion *(Zalophus californianus)*. The California sea lion is the most abundant pinniped in the Southern California Bight. They breed on San Miguel and San Nicolas Islands. Sea Lions are generally seen within 30 miles of their breeding islands, and the greatest density is seen within 3 miles of the islands. Sea lions are rarely seen farther than about 100 miles offshore from the mainland. Approximately 36,000 individuals hauled out and bred on San Nicolas Island alone in 1995. These numbers represent about 25 percent of the total world population. San Miguel Island is considered the northernmost rookery for this species. Table F-1 shows San Nicolas Island California Sea Lion populations for 1989 through 1993.[a]

Table F-1. Pinniped Populations at San Nicolas Island[1]

	Northern Elephant Seal		California Sea Lion	
Year	Pups	Non-pups	Pups	Non-pups
1989	4,751	4,881		
1990	4,146	4,315	11,766	11,827
1991	4,598	4,622	9,348	10,946
1992	5,560	5,381	10,595	13,983
1993	5,207	5,455	16,889	16,020

[1]All seals were counted from aerial photographs: adults during peak breeding season, pups during peak and late breeding season.[b]

Northern elephant seal *(Mirounga angustirostris)*. The northern elephant seal is the largest and second most abundant pinniped in the Southern California Bight, with numbers increasing from a 1986 California population estimate of 37,500 individuals. In the offshore waters peak numbers coincide with movement to and from the breeding beaches of San Miguel and San Nicolas Island in December, January, May and June. Elephant seal rookeries are located on Santa Barbara, San Miguel, San Nicolas, and Santa Rosa islands - the latter now being the largest colony in the world. See Table F-1 for San Nicolas Island Northern elephant seal populations.

Harbor seals (Phoca vitulina). San Miguel, Santa Rosa, Santa Cruz, Anacapa, Santa Barbara, and San Nicolas islands are hauling sites and rookeries for harbor seals. 1995 population in the southern California Bight is about 35,000 individuals.

Northern fur seals (Callorhinus ursinus). The small colony of northern fur seals on San Miguel Island represents the southern breeding limit for this species. It is also the only colony along the eastern Pacific south of Alaska. Since about 100 individuals were first discovered at Adams Cove in 1968, the population had grown to about 10,000 individuals in 1995

Stellar or northern sea lion (Eumetopian jubatus). Since 1968 the northern sea lion has been observed in the Southern California bight only on San Miguel Island, and in steadily decreasing numbers. The island is also the species' southernmost rookery. Total numbers breeding on San Miguel Island are thought to be low, with the total state population estimated at 1,000 (as of the mid 1980s), and with no more than 5 pups being born annually.

Guadalupe fur seal (Arctocephalus townsendi). The Guadalupe fur seal currently breeds only on Isla de Guadalupe in Mexico, although it was once a resident of the Channel Islands. In recent years, occasional male Guadalupe fur seals have been sighted on San Miguel Island but no pups had been observed since 1983. This species is listed by the State of California as Threatened under the State's endangered species protection legislation.

Cetaceans

At least 27 species of whales and dolphins have been sighted in the Southern California offshore area. About 18 species are seen regularly. Of those, the common dolphin, Pacific white-sided dolphin, bottle nose dolphin, northern right whale dolphin, Dall's porpoise, short-finned pilot whale, killer whale, and minke whale are considered residents. Risso's dolphin fin whale, humpback whale, and gray whale are other species possibly residing in the Sanctuary area. Little is known concerning the areas of concentration, life history, or behavior of the resident populations. The migratory pathway of the California gray whale lies well inshore from the outer Channel Islands. Migration routes of other large baleen and toothed whales do pass through the Sea Range.. The Pacific right whale, one of the rarest of the great whales, has also been sighted in the area.[a]

Marine Birds

Over 60 species of marine birds may be using the marine sanctuary and its environs, for nesting and feeding habitat, wintering and/or as migratory staging areas. Of the 16 species resident in the southern California bight, eleven breed in the sanctuary. Some of the colonies represent large percentages of the southern California or statewide total population.

San Miguel Island, together with its small islets supports the most abundant and diverse avifauna in the sanctuary. Nine species have established colonies on the island and form dense feeding concentration in nearshore waters during their nesting season. Santa Barbara Island has several nationally and internationally significant seabird colonies, including the largest Xantus' murrelet colony in the United States, and the only U.S. colony of black storm-petrels.

One endangered species, the California brown pelican, could be present in the launch and splashdown areas.

Invertebrates, Fish, and Kelp

The predominant nearshore communities around the northern islands are the kelp forest, rock bottom, and shallow sand bottom communities. Luxuriant forest-like growth of giant kelp *(Macrocystis pyrifera)* occurs in shallow waters, usually from 26 to 112 feet, throughout the region. Several other

brown algae (e.g., *Agarum sp., Laminaria farlowii, Pterygophora californica)* occur in association with the giant kelp. Small red algae (Rhodophyta) and scattered *Agarum fimbriatum* occur deeper than 112 ft.

Accurate characterizations of the deeper subtidal habitats of the area are extremely limited. Surveys have shown that the benthic fauna of the silt-dominated canyons is diverse. The walls of such canyons are often covered by a dense animal "turf" - a thin living mat of encrusting sponges, bryozoans, and tunicates. Equally high diversities and concentrations are found in the offshore pelagic environments. Common pelagic invertebrates include several copepods and euphausiids, a pelagic shrimp, squid, and the pelagic red crab. Over 30 species of fish are also common to the pelagic environment. Concentrations of the pelagic schooling species such as northern anchovy are a critical food source for other inhabitants, such as the brown pelican.[a]

APPENDIX G
Geology

Both the mainsite and Sea Test Range belong to a region referred to as the Southern California Continental Borderland. The Borderland is a complex of basins canyons ridges and shelves skirting high clipped islands. The area is also characterized by the active seismic faults, shallow oil and gas reservoirs, and natural oil and gas seeps. These are most common in the northern Santa Barbara Channel and are periodic or unconfirmed elsewhere.

The rocky shelves around San Miguel and Santa Rosa islands are among the widest in California and are evidence of intense oceanographic dynamics that have precluded the accumulation of fine sediments. The abrupt depth change from these shallow shelves to deep trenches, combined with the gradation from deepwater silt and clay deposits to shallow sand and rock, account for the wide variety of intertidal and subtidal habitats.

South of Point Conception the cold, temperate waters of the California current flowing from the north meet the warm, temperate waters of the California counter current; and seasonally with the Davidson Current, both flowing from the south. The resulting gyres and eddies affect the distribution of marine fauna leading to the presence of both cold and warm temperature species which thrive in the transition zone, and overlap in their distributions.

Offshore oceanographic features are shown in Figure G-1.

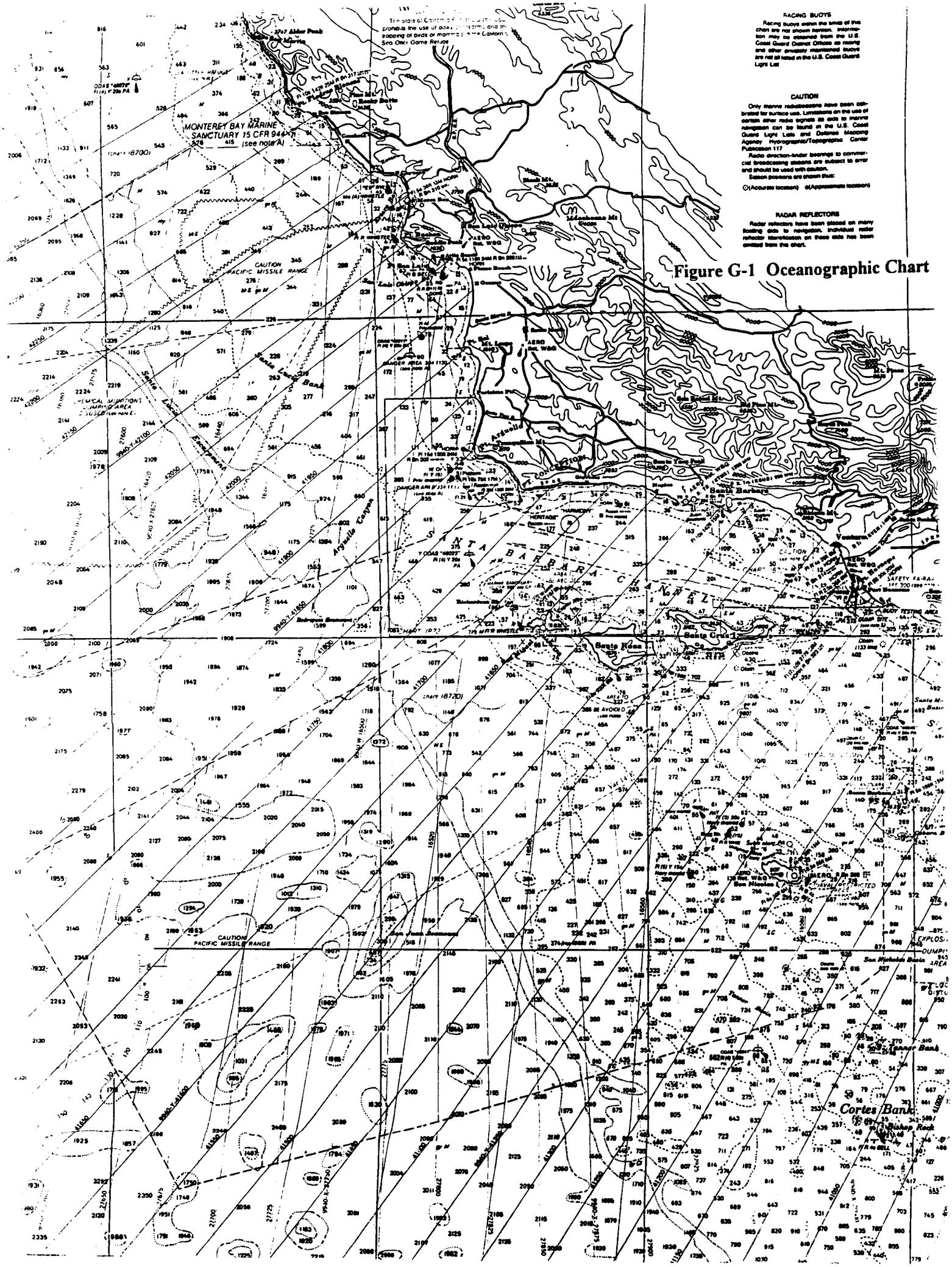

Figure G-1 Oceanographic Chart